

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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The Lacquer Industry of Japan.

Among the Parliamentary papers recently issued is a valuable report by Mr. John J. Quin, acting British Consul at Hakodate, on the lacquer industry of Japan. This business is one in which the Japanese have always greatly excelled, besides which it has hitherto been almost a monopoly in their hands, owing to the high perfection attained and the rigid manner in which the secrets of the pursuit have been guarded. Mr. Quin's report now enables us to peep behind the scenes to some extent, but even after a perusal of his treatise it seems pretty plain that we do not know everything about Japanese lacquering, while the knowledge we thereby acquire adds strength to the conviction that there is little likelihood of the process being successfully conducted out of Japan. In the first place, almost the whole of the many different kinds of lacquers used are the products of trees found only in the Japanese islands, and in the second place the enormous amount of labor bestowed upon the work in its different stages is such as to preclude imitation in any country where labor is of other than merely nominal value. Mr. Quin tells his readers that he has had great difficulty in obtaining thoroughly reliable information, owing to the ignorance of the artificers and the subdivision of labor. Notwithstanding these difficulties, however, the report is replete with interesting particulars, and as it may be purchased at a low price, we would advise all japanners and others engaged in branches of business in which lacquers, varnishes, &c., are used to procure a copy for perusal and reference.

It appears that the various kinds of lacquers are procured by tapping the lacquer tree (*Rhus vernicifera*), which is abundant all over the main island, and is also met with in Kiushiu and Shikoku. Special tools are used for the purpose, and it is said to need a certain "knack" to secure the exuding juice in a pure and proper condition. In its crude state the lacquer is priced at 90 to 100 yen, or, at the present low rate of exchange, equal to between \$12 and \$13 per tub of about 4 gallons. If the subsequent processes could be successfully carried out it might possibly pay to import the raw material into this country. The manufactured article undergoes many transformations, mixtures being prepared and sold in which seaweed-jelly, grated sweet potatoes, soot, charcoal, iron filings boiled in rice vinegar, ground sea-shells, turpentine, whetstone water, camphor, oils, oxide of iron, gold, silver or tin powder and sundry other ingredients are incorporated. Mr. Quin mentions a very remarkable property of lacquer. He says: "If crude lacquer, which is originally of the color and consistency of cream, is exposed to the sun for a few days without adding water, it loses its creamy color and becomes quite black, or nearly so, but also becomes thinner and transparent, or rather translucent, as can be seen when it is smeared on a white board. It will not now, however, dry if applied to an article, even if kept a month or more in the damp press. But if water is mixed with the lacquer which has thus been exposed and become black it at once loses the black color and its transparency, and becomes again of a creamy color, though slightly darker, as if some coffee had been added, than at first. After evaporating this water, it can then be used like any ordinary lacquer, either alone or in mixtures, and will dry in the damp press, during which process it again turns black." Lacquer will not dry or harden properly in the open air. It must have a damp, closed atmosphere to do so, otherwise it would run and remain sticky. The Japanese use a cave, or an underground cellar, where "practicable, or, in default, an air-tight case of wood with rough, unplanned planks inside. These are thoroughly wetted before the lacquered article is put in to dry, the process occupying a period of from 6 to 50 hours, according to the time of the year and the sort of lacquer

used. This appears to be one of the secrets of the Japanese lacquerers, consequently it is of some importance to be aware of the fact.

The business is one evidently requiring patience, care and cheap labor, seeing that Mr. Quin enumerates 33 different processes in applying the lacquer, with periods of drying or rest between many of them of from 12 to 40 hours. The tools, brushers, smoothers, &c., are different for the various sorts of lacquers, as well as for the articles to

Speed of Passenger Elevators.

An immense amount of time is needlessly lost, both in freight and passenger elevators, by having them run slowly. When elevators were first put in, few people seemed to have any idea of saving time. The fact that they could save labor and obviate the necessity of going up and down stairs in the ordinary way, seemed advantage enough. When a man is in a hurry, however, these old elevators are found to be great time

a minute, with little or no perceptible increase in the cost of the work. There is more horse-power consumed, it is true, but the number of foot-pounds expended is practically the same in one case as in the other. There are thousands of elevators in this city which do not run any faster than the old-fashioned hand hoists, and after goods are loaded on the platform the men stand about and wait with a patience which is highly commendable, but by no means profitable to the owner. In the Morse building in

the actual speed in feet per minute, yet our impression is that it is one of the fastest, if not the fastest, elevator that has yet been erected.

Tariff Matters in Victoria.

A Commission on Tariff has been sitting for some time past at Melbourne, and has been taking evidence on the effect which the protective system of the colony of Victoria has had on various industries. According to the *Ironmonger* the opinion expressed by the colonial manufacturers generally was strongly in favor of the retention of the duties. Opposed to them were the views of the representatives of foreign firms trading in the colony. A local manufacturer of grates and such like articles was in favor of the tariff, as also were firms of lamp-makers, tin-plate workers, workers in galvanized iron and stamped iron, and tin workers, with the brassfounders and chandelier manufacturers. Only one witness supported the retention of the duty on horse-nails, and it transpired that he was the only manufacturer of them in the colony. Two firms of colonial iron smelters urged that a duty of about \$10 per ton should be placed on imported pig lead, but, on the other hand, a firm of sheet lead workers opposed the duty unless a similar advantage was obtained by the manufacturers. With respect to the trade materials of plumbers and gasfitters, it was admitted by the colonial manufacturer that their productions were inferior to those of the English, and opinions seem to be divided as to the advantage or disadvantage of retaining the duties. Letters were read from two firms of manufacturers and importers of chandeliers respectively, who had had a dispute on the question before the Commission. An English firm importing small brass fittings, was in favor of the remission of the duty on such goods, and opposed to them was an iron safe maker of Melbourne. Several manufacturers of agricultural implements were in favor of the tariff, a partner of one of the firms advocating on his own account intercolonial free trade. It was also urged by some that the duty on iron pipe and explosives should be increased, and by an importer of watchmaker's tools that the duty on crucibles should be remitted.

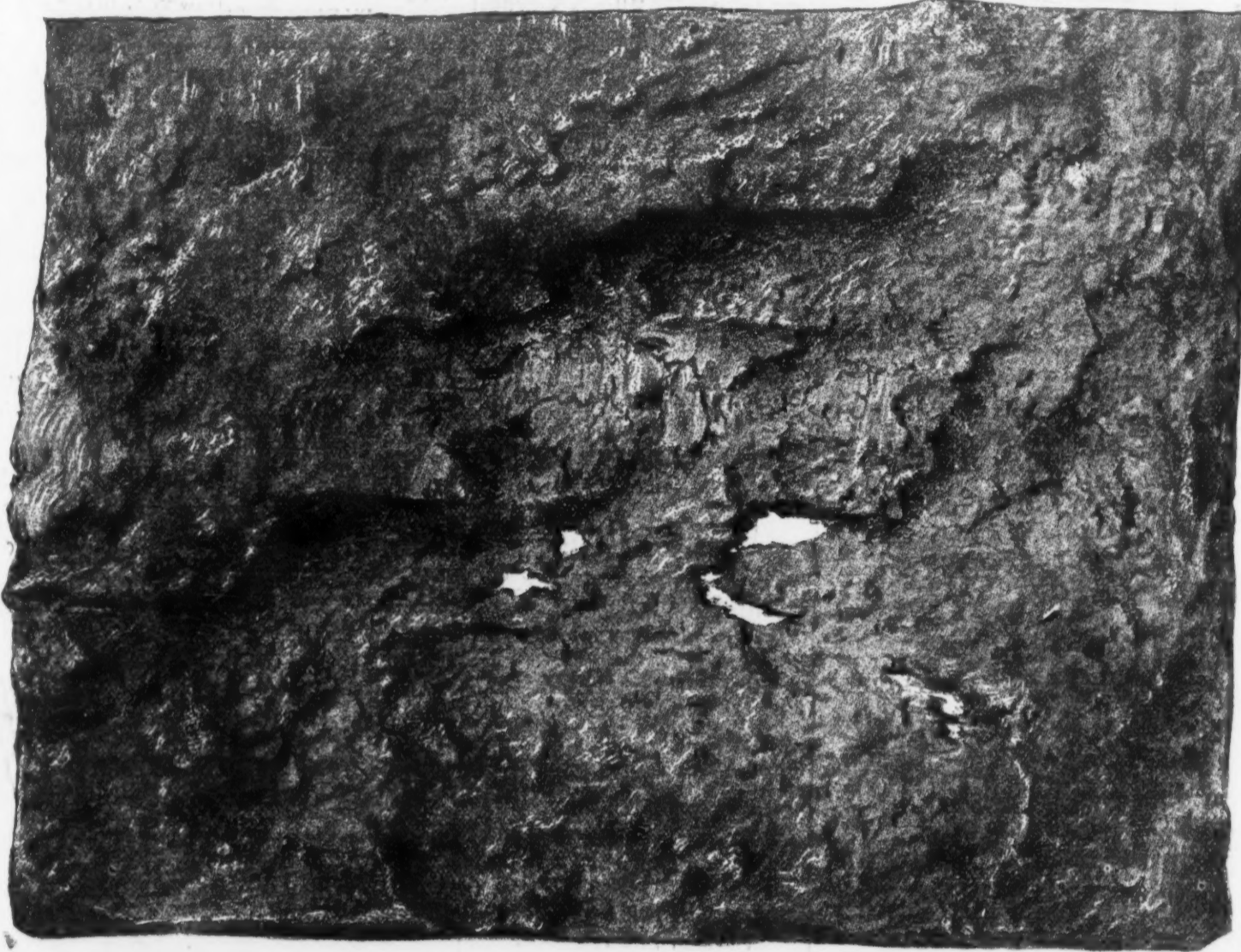


Fig. 1.—Face of Fracture of Beam Strap of Steamer Kaaterskill, a Little More Than Full Size.

which they are applied, gold lacquering, flat or raised, appearing to be the highest form of the art. It is probable that many of these tools and processes might be dispensed with were machinery used, but on the whole we are disposed to think that lacquering, as de-

wasters, and have really no advantage whatever over the ordinary method of getting up and down. In fact, in many buildings a man can descend very much faster than the elevator. Recent machines have been geared to run rapidly, and now

this city the elevators have a run of 106 feet. They make this distance on some occasions, both up and down, in 40 seconds. When one of these elevators is started in a hurry, the passenger descending has the feeling that the bottom of things generally

The Steamer Kaaterskill Accident.

BY ALBERT F. HILL.

The breaking of the walking-beam strap of the steamer Kaaterskill, on the morning of August 19th, when on her return trip to New York, has probably attracted more attention than any similar accident ever did before.

The exceedingly narrow escape from total destruction and frightful loss of life which the accident presented, the death of one of her deck passengers, caused by the escaping steam, coupled with the fact that at the time of the accident she was going at reduced speed, and under very low steam pressure, were circumstances of themselves sufficient to attract attention, and became all the more remarkable from the fact that the machinery was entirely new, and had been constructed by firms of high repute.

The elucidation of the primary cause of the accident presented, under these circumstances, certainly a very interesting engineering problem. The writer visited the disabled steamer shortly after she was towed to the Delamater dock, and before the broken parts of the machinery were taken out of her.

APPEARANCE OF THE FRACTURES.

The fractures of both the upper and lower arms of the strap were found to be short and square. From the position of the wreck it was evident that the failure took place on the up stroke, and that it first occurred in the upper arm 3 feet 3 inches from the center of the forward pin, and that after the fracture of the cast-iron frame, the lower arm broke 6 feet 7½ inches from this point,



Fig. 2.—Development of Fiber by Treatment with Acids, in Longitudinal Vertical Section through Center of A E, Fig. 3.

THE ACCIDENT TO THE BEAM STRAP OF THE STEAMER KAATERSKILL.

tailed in this pamphlet, must remain a handicraft, and will scarcely be transferred to the Western hemisphere with any notable success. At the same time it must be freely admitted that Mr. Quin has cleared up many disputed points, and has given us far more information on the subject than has ever before been known.

there are many at work in New York in new buildings which run so rapidly that a person cannot catch them either in descending or ascending. These passenger elevators are bringing about a great improvement in simple freight elevators. People find that there is no use in waiting four or five minutes for an elevator cage to rise through two or three stories when it can be done in

has been knocked out, and his interiors are dropping regardless of his body. When going up the feeling is reversed, and one's legs appear to have been driven into the body about 20 inches. This is not as bad, however, as the employees' elevator in the Western Union building. The feeling there on the descent is very much similar to that of a downright fall. Though we have not

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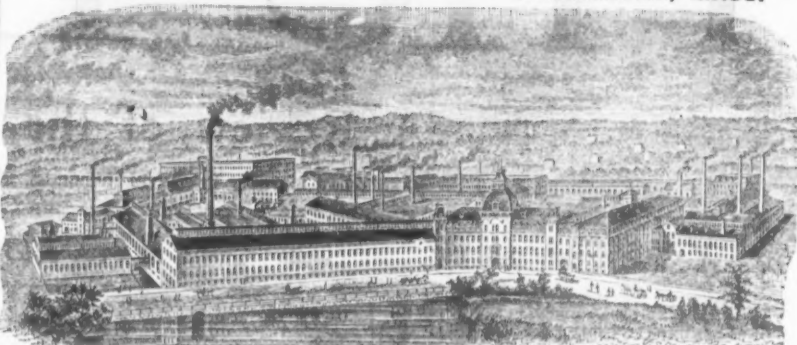
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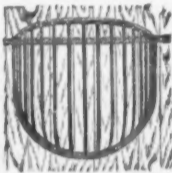
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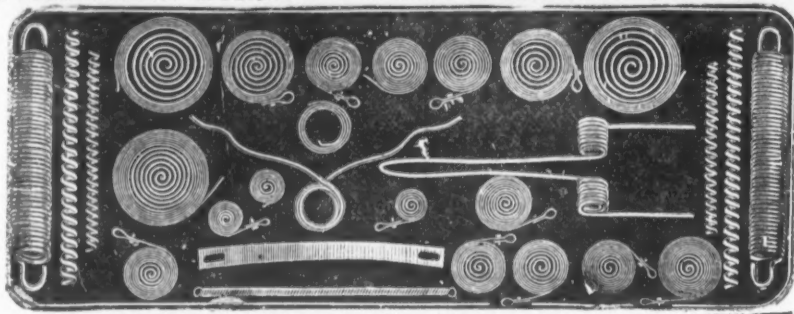
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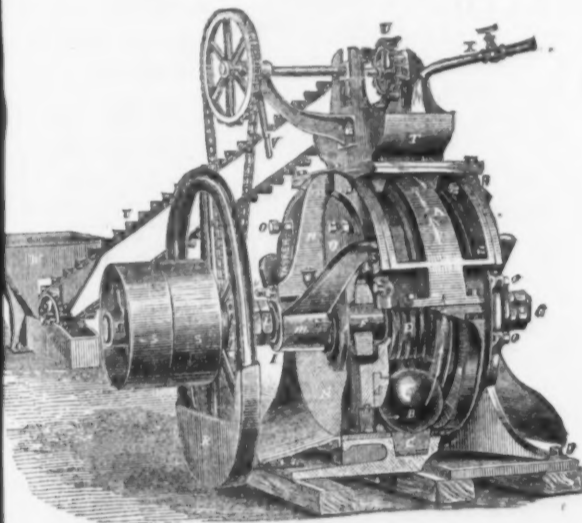


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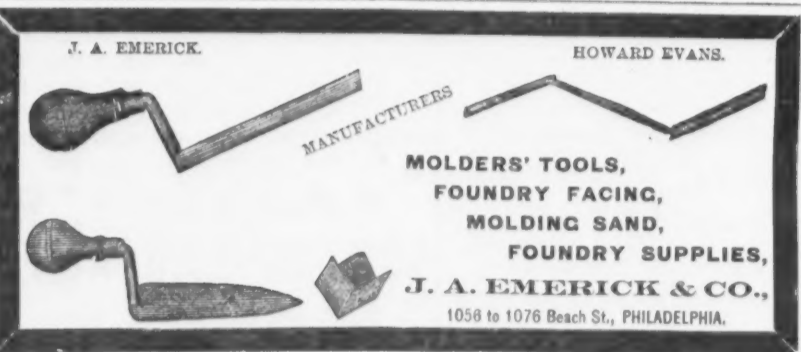
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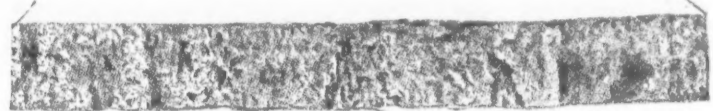
A straight-edge put alongside the remaining parts of the strap showed that no bending whatever had preceded the rupture, and careful measurements revealed the further fact that there was no reduction of area at the points of fracture. The appearance of the fractured faces showed no trace of fiber, and was altogether granular.

An excellent photograph of the fracture of the upper arm of the strap was obtained, and is reproduced in Fig. 1.

POSSIBLE CAUSES OF FAILURE.

A careful consideration of all the circumstances attending the failure, and minute

be lost sight of, that the mode of fracture exerts a considerable influence upon the appearance. For instance, fine, fibrous iron, if pulled apart gradually by successive and increasing strains, will undoubtedly show a fibrous fracture; so it will also if the bar be slightly nicked first, and then gradually bent cold to the point of rupture. But then take this same iron and break it suddenly, especially by what may be termed a shearing shock, or even by the sudden application of a load far in excess of its ultimate strength, and the fracture is sure to have instead of a fibrous, a granular, or as it is sometimes termed, a crystalline appearance. As was



The Kuaterskill Accident.—Fig. 3.—Faces of Fracture of Test-Piece A, Fig. 9.

inspection of the different parts of the engine, left no doubt that the accident was entirely due to the breaking of the strap, and that no other part of the machinery had given way previously to it. The first question that presented itself then was to see if the breaking of the strap could be accounted for by defective design, i. e., lack of proper dimensions. The section of the strap was $4\frac{1}{4}$ by $6\frac{1}{4}$ inches, except in the parts toward the eyes, where these dimensions gradually increased. The section of the part that broke first was found to be $5\frac{1}{4}$ by $6\frac{1}{4}$

stated before, and as is shown in Fig. 1, the fractures of the strap were very decidedly granular, part of it, as is seen, tolerably fine, part of it rather coarse. The next question to solve then was how much of this appearance was due to the shortness of the iron, and how much to the mode of fracture. The solution of this question was sought to be accomplished by the following

METHOD OF TESTING.

Having secured, through the courtesy of the Messrs. Fletcher, the short part,



Fig. 4.—Faces of Fracture of Test-Piece B, Fig. 9.

inches. These dimensions, taken in connection with

Diameter of cylinder, inches.....63
Stroke of piston, feet.....12
Allowed steam pressure, pounds.....50
Vacuum, pounds.....13
showed that the strap was designed with ample strength for its service, and, in fact, rather in excess of its requirements. Neither was there any indication of defective construction or adjustment, and to save both space and time it might as well be stated here that the whole of the machinery bore evidence throughout of good workmanship,

A E D, Fig. 7, of the broken strap, and it being desirable to begin work as close as possible to the fracture, the section X, Fig. 10, was first cut off in the slotting machine. This gave a plate varying in thickness from $\frac{1}{2}$ inch to $1\frac{1}{4}$ inch, and containing simply the fractured face of the upper arm of the strap. The back of this plate was carefully planed, and then treated with acids to bring out the cross-grain, and to develop any evidence there might be of defective welding. No bad weld showed. The grain was found opened out vertically across the section, especially in the center of the strap,



Fig. 5.—Faces of Fracture of Test-Piece C, Fig. 9.

and was exceedingly well put together. The exact similarity of both fractures rendered the presence of any local defect, such as a bad weld, for instance, extremely doubtful; moreover, there was no evidence of any such flaw—and the conclusion was, therefore, almost irresistible that the strap broke either because it was made of poor, short iron throughout, or because it had been subjected to the strain of a shock, the force of which was far in excess of that which any possible steam pressure could have exerted. The scope of the inquiry having thus been narrowed to these two points, it became evident

and the acid also developed a small, hard and steely spot of a little over a square inch in section, toward the lower left corner.

Adjoining this cut, and distant from it merely the width of the cutting tool, two more plates were taken from the cross section of this arm of the strap. Each of these two plates was $\frac{1}{2}$ of an inch in thickness. They were carefully planed on both sides, and microscopic examination showed that in them also the opening out of the fibers, especially in the center, was well defined. The first plate—the one nearest to the break—was then cut vertically into three strips, A, B and

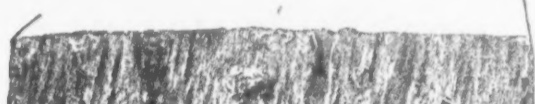


Fig. 6.—Faces of Fracture of Test-Piece D, Fig. 11.

that a thorough and searching investigation of the iron in the strap was the first thing in order.

THE MATERIAL MUST TELL ITS OWN STORY.

It is always best, in an investigation of this kind, to start out with no preconceived theories. The experimenter may safely trust to the material to tell its own story—and it is simply his business to see that he gets the whole story out of it. To the experienced eye the appearance of the fracture is a tolerably sure criterion of the quality of the metal. Nevertheless, the fact must not

C, as shown in Figs. 8 and 9, and the succeeding plate was cut horizontally into the three strips, D, E and F, as shown in Figs. 8 and 11. These pieces were then torn apart in the testing machine. The directions of the strains applied, and the lines of fractures developed, are shown in Figs. 9 and 11. The numerical results of these tests are collated in Table I, and the photographs taken of the fractures are reproduced in Figs. 3, 4, 5, 6, 13 and 14.

As will be seen, the line of the break of the pieces A, B and C of the first plate is through the center of the strap, and the torn edges in E

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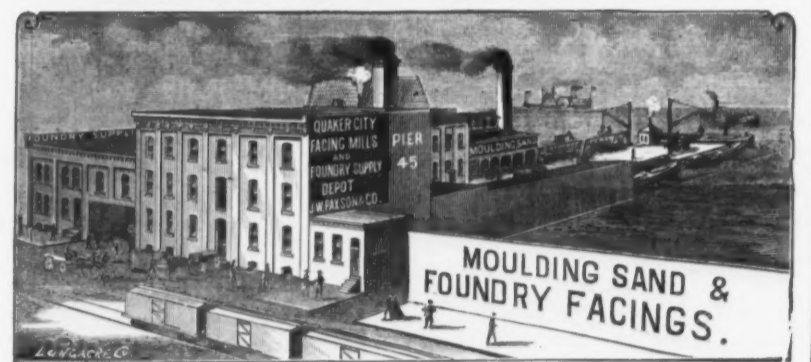


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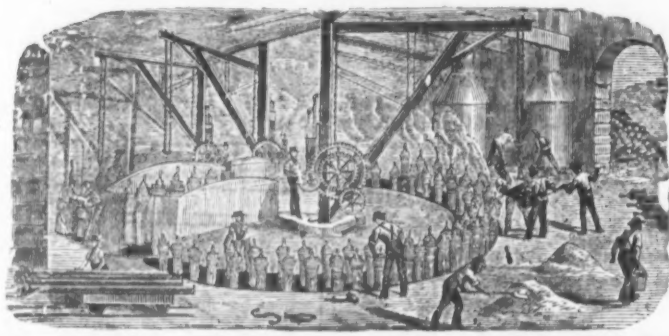
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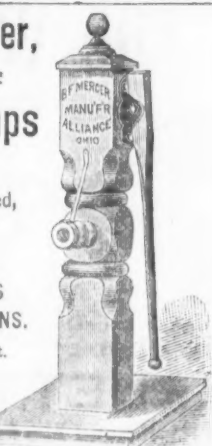


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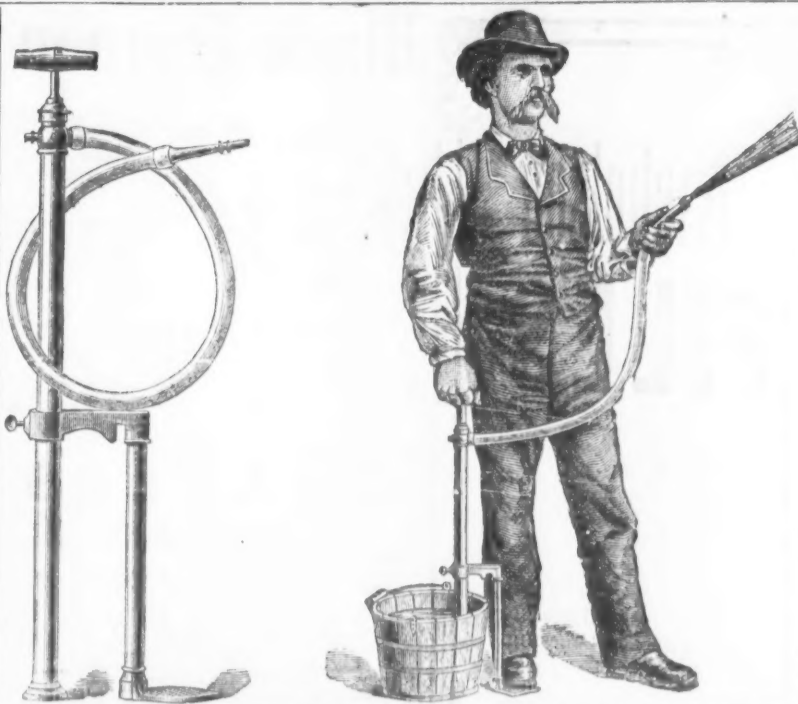
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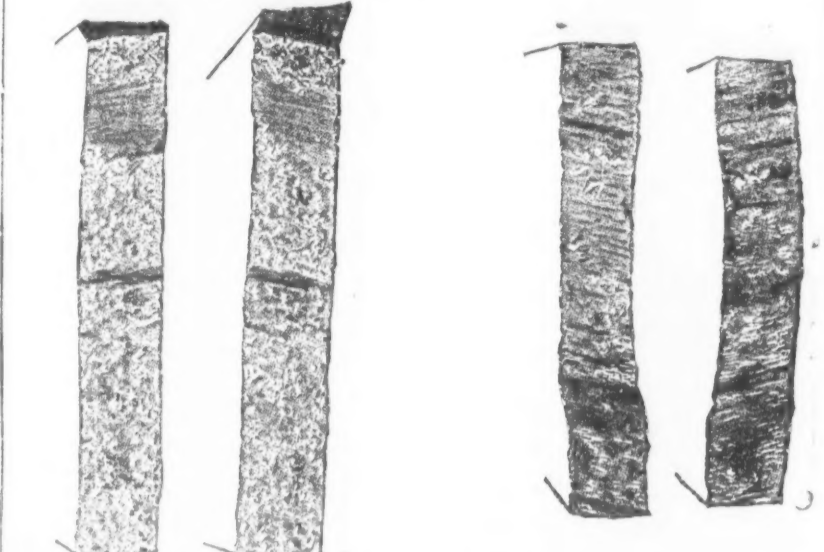
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observations that were taken proved, as was
anticipated from the proximity of the speci-
mens to the fracture, that the elastic limit
very nearly coincided with the ultimate
strength.

TENSILE TESTS.
Following these plate tests a series of ten-
sile tests was made. For this purpose a strip

a correct opinion of the strength of the strap
before failure, it will be but fair to allow at
least from 10 to 15 per cent. for the advan-
tages gained by this method of testing. On
the other hand, the percentages of elongation
and reduction of area form a reliable basis
for judging of the quality of the material and
the workmanship.



The Kaaterskill Accident.—Fig. 13.—Faces
of Fracture of Test-Piece F, Fig. 11.

Fig. 14.—Faces of Fracture of Test-Piece
E, Fig. 11.

13 1/2 inches wide and 18 inches long was
slotted longitudinally out of the center of the
upper arm of the strap, as shown in Figs. 8, 10
and 12. This strip was cut up into six pieces
marked G, H, I, K, L, M. Each piece was then
turned down in the lathe to 3/8 inch diameter

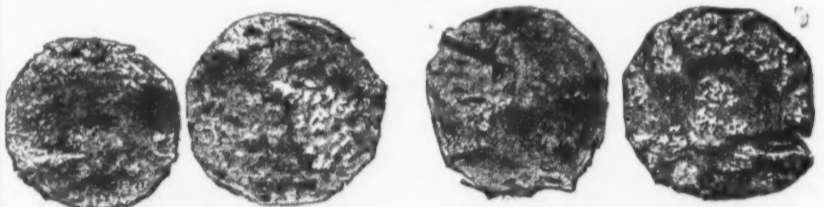
The character of the fracture, in conjunc-
tion with the numerical test results, shows
the core of the strap to have been weaker
and far more crystalline than the outside of
it—a result which may always be expected
in built-up forge work, as it is practically

TABLE I.—TESTS OF SECTIONS CUT CLOSE TO FRACTURE FROM UPPER ARM OF BEAM STRAP OF
STEAMER KAATERSKILL.

Mark.	Dimensions.	Area in square inches.	Breaking load, in pounds		Fracture.—Per cent.	Remarks.
			Of section.	Per sq. inch.		
A.....	2.08 X .257 X 5.30	.53456	10,180	18,931	Fibrous..... 90 Granular..... 10	Torn apart vertically across the grain, as shown in Fig. 5.
B.....	2.06 X .258 X 5.30	.53148	11,350	21,355	Gr'lar in one spot, 21 Fibrous..... 85	
C.....	2.04 X .257 X 5.30	.52408	13,450	25,654	Fibrous..... 90 Granular..... 10	
D.....	1.583 X .25 X 6.75	.30575	14,315	36,121	Granular..... 5 Fibrous..... 95	Torn apart horizontal- ly across grain, as shown in Fig. 7.
E.....	1.522 X .253 X 6.75	.38507	13,380	34,596	Granular..... 10 Fibrous..... 90	
F.....	1.665 X .253 X 6.75	.48124	15,370	36,487	Granular..... 90 Fibrous..... 10	Imperfect weld.

for a length of about 8 inches in the middle.
The cylindrical part of these test pieces was
connected with its square ends by long and
easy fillets. These six pieces, representing
top, core and bottom of the center of the
strap, were broken under tensile strain, with
the results shown in Table III. The photo-

impossible, when moving large masses of
metal under the hammer, to give the inside
of it the same amount of working as the out-
side receives. All the foregoing tests were
made in the testing machine of the U. S.
Steamboat Inspector's Office, in this city,
and the writer is greatly indebted for many



Figs. 15 and 16.—Faces of Fractures G
and H, Fig. 12.

Figs. 17 and 18.—Faces of Fractures I
and K, Fig. 12.

graphs of the fractures are shown in
Figs. 15, 16, 17, 18, 19 and 20.

FEATURES OF THE RESULTS.

The most striking features of the results in
Table III are the nearness of the elastic limit
to the ultimate strength, the good percent-
ages of elongation and reduction of area ob-

courtesies and most efficient assistance to
both Captain Tower and Mr. Buckalew, of
that office.

Table IV contains a synopsis of the tests
made at the Watertown Arsenal on behalf of
the Coroner's office. Comparing the results
obtained there with those given in Table
III, we find the same high ratio of elastic

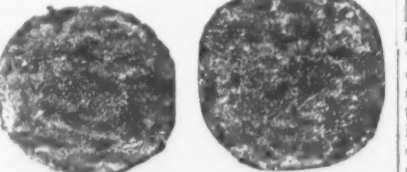
TABLE II.—TESTS OF SECTIONS CUT CLOSE TO FRACTURE FROM LOWER ARM OF BEAM STRAP OF
STEAMER KAATERSKILL.

Mark.	Dimensions.	Area in square inches.	Breaking load, in pounds		Fracture.	Remarks.
			Of section.	Per sq. inch.		
B1.....	2.06 X .256 X 4.5	.52736	16,320	30,946	No flaw in any of the specimens. Frac- tures average 70 per cent. fibrous and 30 per cent. granular.	Torn apart vertically across the grain, sim- ilar to what is shown in Fig. 5.
B2.....	2.02 X .259 X 4.5	.50059	12,380	23,780		
B3.....	2.04 X .256 X 4.5	.52224	15,050	28,818		
B4.....	1.402 X .253 X 6.2	.35471	12,500	35,240	No flaw in any of the specimens. Frac- tures average 70 per cent. fibrous and 30 per cent. granular.	Torn apart horizontal- ly across grain, sim- ilar to what is shown in Fig. 7.
B5.....	1.3-8 X .253 X 6.2	.33502	10,900	32,938		
B6.....	1.431 X .254 X 6.2	.35918	12,250	34,105		

tained, and the marked difference between
the character of the fractures of the outside
pieces and of the core pieces. The high fig-
ures obtained for elastic limit and ultimate
strength are unquestionably due, in the first
place, to the raising of both the elastic limit

limit to ultimate strength, though on account
of the much greater section of the test
pieces, the results obtained are not quite so
high.

The fact that in these tests the core-pieces
show best, or rather strongest, is easily ex-
plained on the ground that those pieces were
planed on both sides, and therefore free from
hammer-checks and other irregularities, thus
having the full benefit of their cross-section,
which, of course, could not be the case in the
outside pieces, which were cut only on one
side, and went into the draw-heads just as
they were taken from the beam-strap. But
here also the elongations and classification
of the fractures form a sufficient basis to
come to a correct conclusion as to the quality
of the material, &c.



Figs. 19 and 20.—Faces of Fractures L and
M, Fig. 12.

CONCLUSIONS.

Any flaw from either poor stock or a bad
weld, of sufficient magnitude to cause failure
of the strap under the allowed maximum
steam pressure, could not possibly have been
confined strictly to the plane of the fracture,
and traces of it would have had to be found
in the test pieces taken from within one inch

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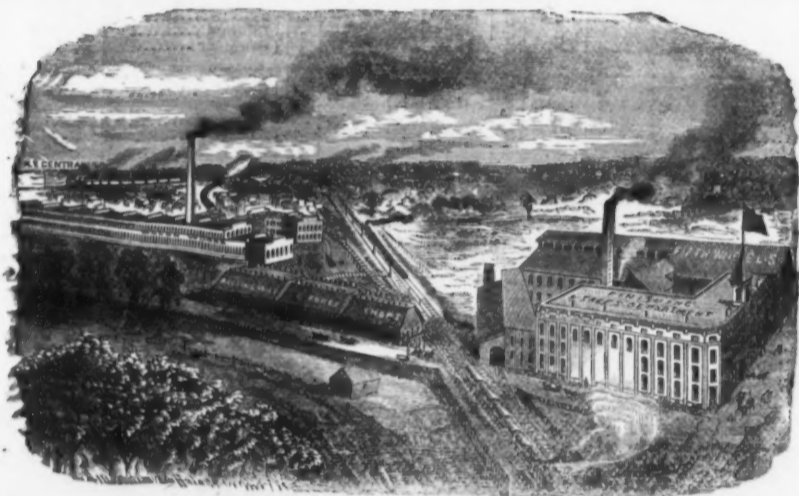


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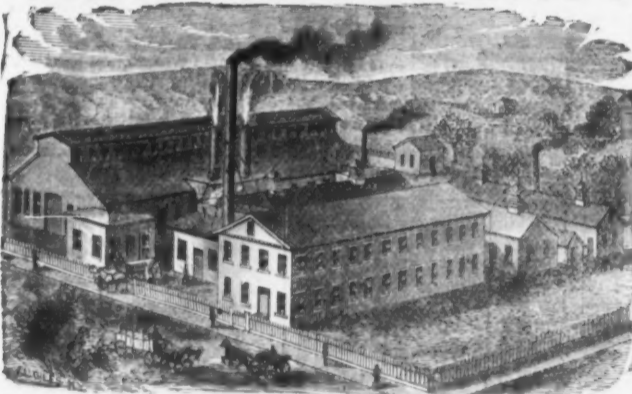
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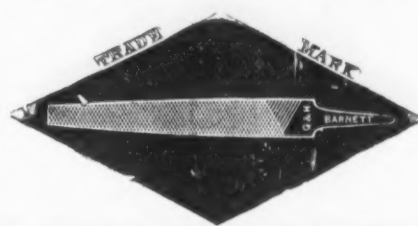
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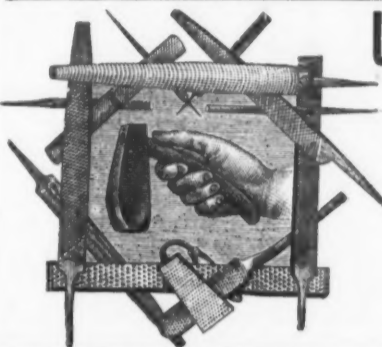
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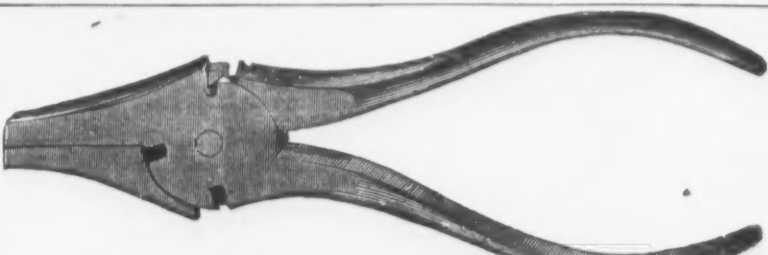
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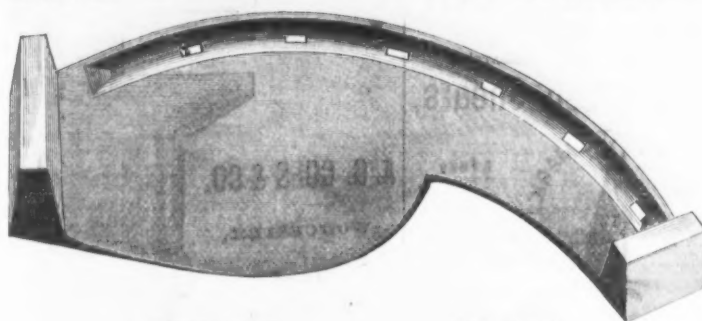
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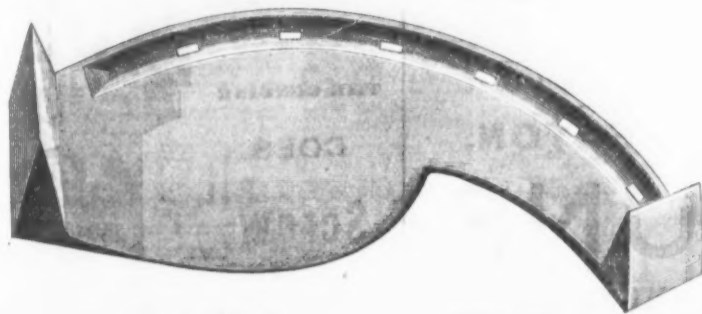
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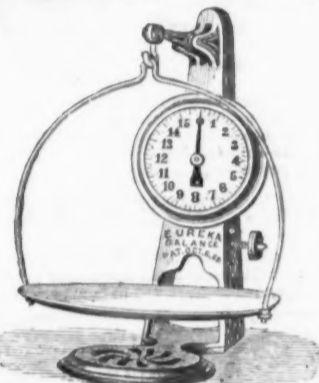
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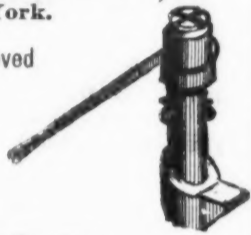
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of the break. It would have been phenomenal indeed, if the treatment with acids, microscopic examination, and breaking under cross-strains in both directions—a rather severe cross-examination, of the witness—besides the longitudinal tensile tests made here and at the Watertown Arsenal, should all have failed to bring out whatever imper-

Table III.—RESULTS OF TENSIONAL TESTS MADE OF SIX PIECES CUT VERTICALLY OUT OF THE LONGITUDINAL CENTER SECTION OF UPPER ARM OF BEAM STRAP OF STEAMER KAATERSKILL. PIECES TAKEN FROM ADJOINING THE FRACTURE.

Mark.	Length, inches.	Gauged length, inches.	Area, sq. in.	Load in lbs. per sq. in. of section, at Elastic limit.	Rupture.	Per cent. Elongation.	Diam. of fracture, inches.	Reduc. of area, per cent.	Remarks.
G.....	1.31	1.1272	33.577	49,917	16.3	475	.43	43	Fracture good, fibrous.
H.....	1.30	1.1172	36,134	53,140	10.5	545	.25	25	90% fibrous; 10% granular.
I.....	1.30	1.1172	36,134	48,455	45.4	486	.41	41	Opened out lengthwise, showing imperfect welding, fibrous.
K.....	1.28	1.1074	39,055	48,530	11.3	577	.16	16	Fracture bad, short, all granular.
L.....	1.28	1.1074	39,055	40,632	15.3	483	.47	47	Fracture fine, silky, all fibrous.
M.....	1.25	1.0779	27,700	45,367	13.	555	.22	22	Fracture good, fibrous but not silky.

Average elastic limit per square inch, 35,641 lbs. Average ultimate strength per square inch, 48,143 lbs.

fections of workmanship or material might have entered into the beam-strap.

The test results, the appearances of the fractures, the longitudinal development of the fiber in the center of the beam by acid, Fig. 2, all tend to show that the grade of the scrap used in the piles was above the average, that the heating had been very uniform, only few fire-checks being discernible in the fractures, and that the material had been well worked under the hammer. This, taken in connection with the large effective section of the strap, leaves no room for any other conclusion than that the strap broke from the effects of a shock, the force of which was far

surplus metal by means of powerful mechanical tools, in order to give the piece its definite form. I will pass over the very minute tests to which each hoop is subjected, my wish being merely to place before you the intrinsic quality of the metal. (1) The bar to be subjected to the drop test is of square section, 1.13 x 1.13 inches, and 7.08 inches long. It is placed on two supports or knives 6.29 inches apart; the anvil weighs 771.61 pounds, and the monkey 39.63 pounds. This bar must stand, without breaking, 15 blows at least of a 39.63 pounds monkey falling from a height of a little over 9 feet. (2) The bars to be subjected to tensile tests have a diam-

Table IV.—SYNOPSIS OF TESTS MADE AT WATERTOWN ARSENAL, MASS., OF PIECES OF BEAM STRAP OF STEAMER KAATERSKILL.

Number.	Length, inches.	Gauged length, inches.	Width, inches.	Thickness, inches.	Sectional area, sq. in.	Percentage of elongation, 4 in. of area, per cent.	Load applied, lbs.	Elastic limit, lbs. per sq. inch.	Elastic limit, lbs.	Classification of fracture.
1	48	40	4.80	1.88	3.08	4.3	370,200	41,042	31,170	Granular.
2	48	40	4.80	1.74	2.85	4.1	325,300	38,650	25,750	Granular from fine to coarse.
3	48	40	4.80	1.67	2.65	3.7	310,100	36,130	26,380	Fibrous.
4	48	40	4.75	2.07	3.83	8.7	371,500	37,790	28,090	Granular, 90% Fibrous, 10%.
5	48	40	4.75	1.67	2.65	8.2	338,000	42,620	26,450	Fibrous.
6	48	40	4.75	1.74	2.85	2.2	281,000	34,020	28,450	Fibrous, 80% Granular, 20%.

Nos. 1, 2, 3 were part of top of beam which broke first. Area, 3 1/2 x 6 1/2. Average strength per square inch = 40,114 lbs. Average elastic limit per square inch = 37,747 lbs.

Nos. 4, 5, 6 were part of bottom member of strap. Average strength per square inch, 36,141 lbs. Average elastic limit per square inch, 27,973 lbs. Average strength per square inch of 1, 2, 3, 4, 5 and 6 = 39,120 lbs. Average elastic limit per square inch of 1, 2, 3, 4, 5 and 6 = 27,860 lbs.

in excess of any strain the steam pressure could have brought upon it. What this shock was, how it was occasioned, &c., are questions which do not come within the province of this article, as the writer simply proposed at present to lay before his readers the results of his examination of the iron in the strap.

Notes on the Manufacture of Solid Steel Castings.*

The studies still continued at Terrenore are now being directed to two points in the process: 1, the manufacture of large castings; 2, the methods of annealing and tempering to be applied to the metal, in order to give it all the mechanical properties corresponding to its chemical composition. The end in view is the substitution of steel for cast iron in all pieces of mechanical construction. But the final solution of this problem is still a long way off. The production of castings of any form and of any dimensions in steel of a well-determined chemical composition, combining the resistance and rigidity of steel with the smooth surface and homogeneity of iron castings, is a very complicated problem, and one which presents material difficulties of more than one kind. The last progressive step made at Terrenore is worthy of notice. An engineering firm in Paris required some cylinders of cast steel, having a diameter of 6 feet 7 inches and a height of rather more than the diameter, with a uniform thickness of metal of 1.97 inches. These cylinders were to support an internal hydraulic pressure of 45 atmospheres, without showing any sign of percolation. The annealed metal was to have a minimum resistance of 63,500 pounds per square inch, and a minimum extension of 5 per cent. Of these cylinders six have already been cast. The external surfaces of the castings are quite as smooth as if made of cast iron, and yet the metal is comparatively soft. It contains on the average: Carbon, 0.65 per cent.; manganese, 1 per cent. to 1.20 per cent.; and silicon, 0.25 per cent. to 0.30 per cent. It is, in fact, the quality demanded for rails by one of the French companies. The flanges of the cylinders, after turning, took a very fine polish, even at the gits, and were free from any defects. The metal is cast in molds of loam, pierced with numerous holes to allow the gases to escape, and dried with great care. It is run in at the top of the mold, and not at the bottom, the time occupied in casting being less than two minutes. This particular point should be noticed. The second point upon which the experimental studies of Terrenore are being directed comprises the various methods of annealing and tempering applied for the purpose of assuring the molecular transformation of the metal, and of establishing the equilibrium of the molecules of a casting of prescribed form, and consequently of enduing it with the highest mechanical qualities corresponding to the chemical composition of the metal. It may, however, be of interest to the Institute to learn the practical results obtained in what is considered an extremely delicate manufacture—that of hoops for cannon. More than two years ago Terrenore supplied to the French navy a considerable number of hoops for guns of 3.94 inches. To-day we are working on an order for hoops of the same type, the specifications for which are more severe. I am only speaking of round hoops, which are of the following dimensions:

eter of .51 inches, and a net length of 3.94 inches. The minimum conditions to be fulfilled are—

Limit of elasticity..... 38,000 lbs. per sq. in.
Breaking strain..... 71,100
Extension measured after rupture..... 14 per cent.

Between two bars from the same hoop a variation of 7620 pounds per square inch is allowed in the limit of elasticity, and 8850 pounds per square inch in the breaking strain. The following table contains a certain number of results obtained at Terrenore with cast steel hoops made during the present year:

Nos.	In lbs. per square inch.		Elongation, Per cent.	Contraction, Per cent.	No. of blows.	Deflection in inches.
	Elastic limit.	Ultimate strength.				
1...	50,040	81,800	16.6	26	24	1.22
2...	48,590	84,900	16.8	28	29	1.25
3...	51,080	85,700	15.6	29	30	1.25
4...	51,180	84,700	14.9	34	34	1.24
5...	45,840	76,340	17.0	43	39	1.29
6...	49,920	84,180	15.4	33	36	1.22
7...	47,240	80,760	18.3	44	34	1.26
8...	48,880	82,800	17.3	36	35	1.26
9...	48,260	82,280	20.1	45	45	1.25
10...	50,500	84,700	17.6	46	44	1.27
11...	48,400	82,600	18.1	45	44	1.27
12...	49,900	81,680	17.3	46	36	1.24
13...	51,800	86,340	13.2	39	45	1.22
14...	50,540	81,200	13.6	45	47	1.24
15...	48,640	81,800	17.2	47	38	1.30
16...	47,740	80,100	16.1	32	33	1.26
17...	47,500	79,480	14.9	36	26	1.30
18...	46,850	81,000	14.4	28	27	1.42
19...	48,120	80,000	15.7	48	44	1.27
20...	45,720	71,850	24.6	39	23	1.55

Each of these figures represents the mean of two tests, in which the differences observed in the limit of elasticity and the breaking strain varied from 120 pounds per square inch to 1300 pounds per square inch. Tests Nos. 9, 10, 11 and 12 are those of hoops which had been tempered three times in oil. No. 13 has a somewhat low extension, but a high breaking strain. A charge is occasionally produced giving a breaking strain of 80,000 pounds per square inch, or more, and an extension of less than 13 per cent. In this case the series of hoops to which this tested hoop belongs are again heated and tempered in oil at a temperature lower than that at which they were previously tempered. By this means the extension is considerably increased, without diminishing the breaking strain too much. On the other hand, when the breaking strain is too low and the extension high, the new tempering is effected at a higher temperature than the preceding one. In regular working, all the hoops are heated to a yellow oxidizing color, and at that temperature are plunged into a given weight of oil in the direction of their axes. They are allowed to cool in the oil, and are reheated at a temperature varying from bright cherry-red to a dull cherry color, according to the chemical composition of the metal, and then tempered again in a bath of oil, in which they are allowed to cool. The first tempering transforms the crystalline grain of the metal into a fine homogeneous grain; the second determines the molecular equilibrium of the casting, which corresponds to the chemical composition of the metal, and should be more or less intense, according as the metal contains more or less than 0.3 per cent. of carbon and 0.5 per cent. of manganese. The chemical composition of the metal suitable for this delicate manufacture is comprised between narrow limits. The carbon varies from 0.28 per cent. to 0.32 per cent.; the manganese from 0.60 per cent. to 0.45 per cent. The sulphur can scarcely be detected, and the silicon is pretty nearly constant between 0.15 per cent. and 0.20 per cent. I will not close my paper without risking a few words on the famous question of blow-holes in

*Paper read before the Iron and Steel Institute by M. A. Pourcel.

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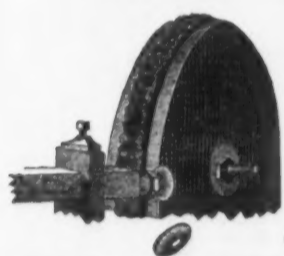
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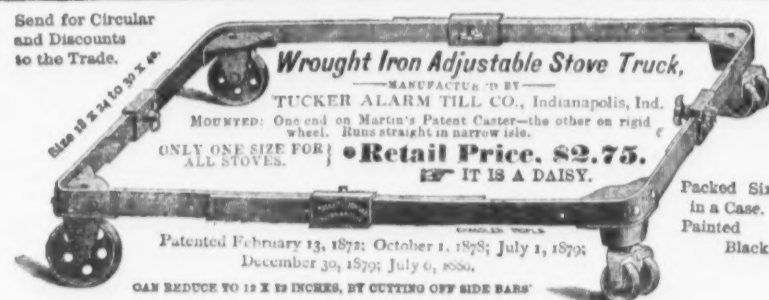
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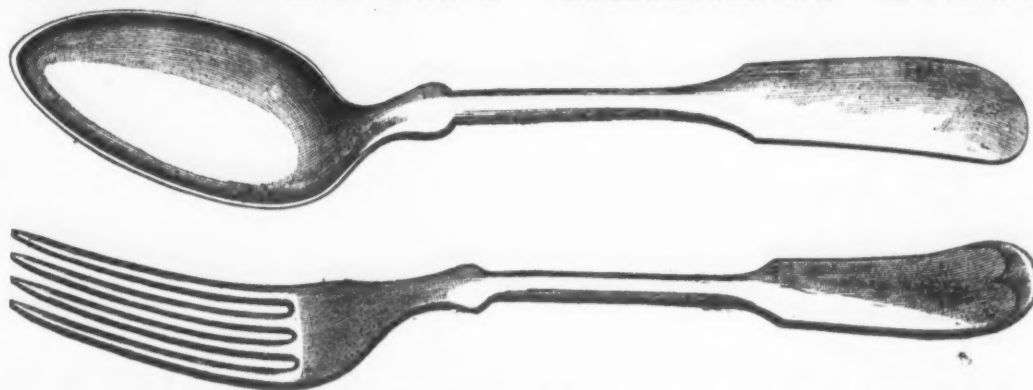
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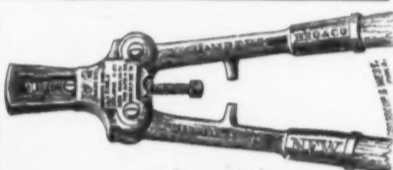
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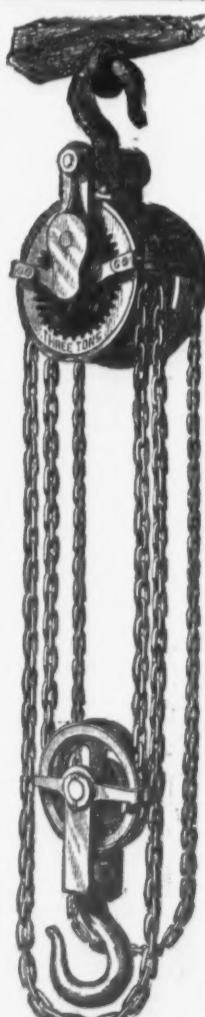
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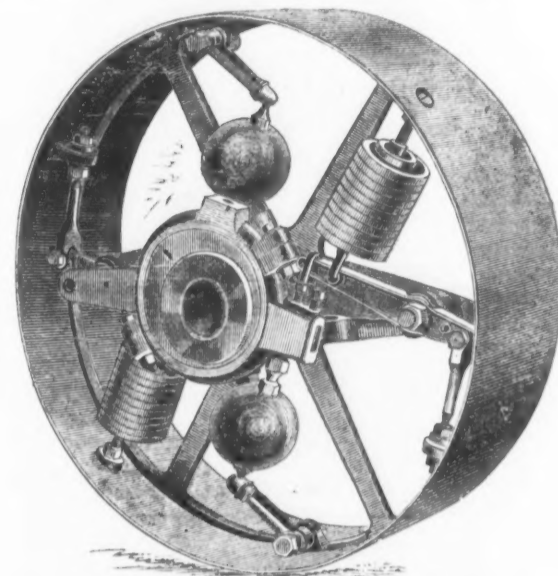
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steel, which remains, so to speak, a permanent order of the day in the proceedings of the Iron and Steel Institute. I mention, simply as a reminder, that solid soft steel castings are obtained by means of alloys of silicon, manganese and iron, with a minimum of carbon. Alloys which fulfill that very essential condition of containing but a minimum of carbon, are those in which the silicon and manganese are found in the proportion of their chemical equivalents. It is very difficult, if not impossible, to attain this with mathematical regularity. I have, however, succeeded, after numerous observations, starting with a burden calculated to a very great nicety, in producing these kinds

A Novel Governor.

An invention relative to steam engine governors has been made by F. H. Ball, of the Ball Engine Co., of Erie, Pa., which introduces what will strike most of our readers as an entirely new principle or theory for their action. The Ball governor, instead of depending on variations in the speed of the engine for securing a general uniformity, takes an entirely new departure, and makes the variation in the load the means for regulating the speed. It is generally admitted that the theory of an engine governor of the ordinary type is defective. These governors only act when the speed changes, and, although the



A Novel Governor.—Fig. 1.—View of Governor from Outside.

of alloys of the desired formula, containing up to 13.5 per cent. of silicon and 18 per cent. of manganese. These alloys are added at a red heat to the bath of metal—Siemens-Martin process—immediately before casting. The process is, in fact, the same as obtains in the manufacture of soft metal with ferromanganese. But the addition of ferromanganese to a bath of soft metal is followed by a more or less violent reaction, accompanied by a disengagement of gas. With the addition of the alloy of silicide of manganese, on the contrary, the intermolecular reaction is calm. All ebullition is instantly arrested; the surface of the bath becomes quiet, and no gas rises through the slag. It is universally admitted that the gas disengaged from a bath of metal in the middle of the refining period is carbonic oxide. Well, the addition of three or four thousandths of silicon, in the form of silicide of manganese and silicide of iron, is sufficient to instantly arrest this disengagement of carbonic oxide gas. The sample of metal taken before the addition of silicon is full of blow-holes; that taken after compact and homogeneous. Is this a purely physical action? Is it a sufficient explanation to say that the silicon has determined the solution of the hydrogen in the metal? But, in any case, it is carbonic

best of them act within exceedingly small limits, there must be certain irregularities of motion in order that they may act at all. Theoretically, the ordinary governors cannot keep an engine at a uniform speed under wide changes of load. They act only within certain limits, which are largely a matter of adjustment. Usually, if the governor is very sensitive to changes of speed, it will be unstable in its action, causing an intermittent flow of steam to the engine if it is a throttling governor, or irregular cutting off if it is a cut-off governor. It will be always "hunting," as the engineering phrase goes. Usually, the adjustment is made so that as they move to increase the steam supply they meet a constantly increasing resistance to further motion. This gives them stability of action, but makes the total change of speed between full load and entirely empty a very considerable amount. The new theory which Mr. Ball has developed in the construction of his governor is to bring about changes in the point of cut-off, or in the supply of steam, by the changes of load itself, instead of by changes in the speed of the engine. As the change of load is what causes variation in the speed of the engine, it evidently should determine the amount of steam admitted to the cylinder. This theory is eminently a rational one. The

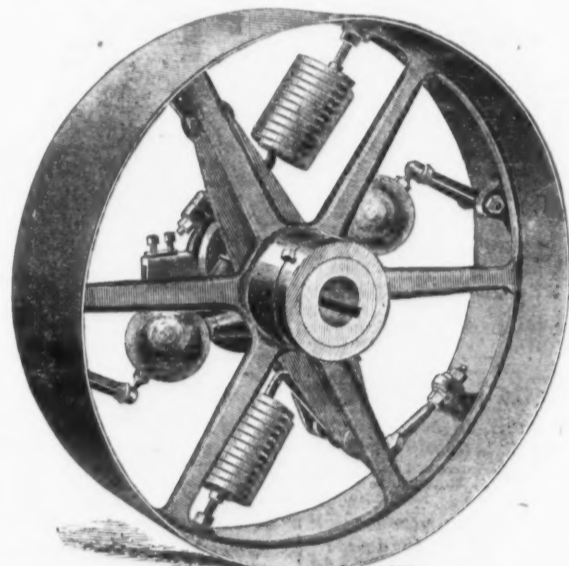


Fig. 2.—Inside View.

oxide that is evolved before the addition of the silicon, and little or no hydrogen, according as the manganese is present in small proportion in the bath of steel, or is entirely absent. Metal made with silicide of iron always remains brittle under drop tests, and gives but low extensions under tensile strain, with a low and variable breaking load. These bad qualities come to light in forging. The metal cracks under the blows of the hammer, while metal made with silicide of manganese behaves in a much more satisfactory manner.

The manufacture of iron pans at Amoy, China, a large industry, is in the hands of two houses—a monopoly. The sale of iron pans in China is said to be enormous, and the export of the same from Amoy, principally to the Straits Settlements, increased from 1,242,639 pounds in 1880 to 1,420,864 pounds in 1881. It was ascertained that the pans could be manufactured at Amoy, shipped abroad, and sold for one-half the price charged by the monopolists, and two men, an Englishman and a German, started foundries at Amoy with that fact as a basis of their intended competition. The local authorities, however, took a "furious stand" against the invasion of the foreigners, and Pekin officials have under consideration a request from Amoy to prevent the prosecution of the enterprise by foreigners, so surely calculated to reduce the Chinese monopolists to the necessity of paying their laborers European starvation day wages.

* Taking the equivalent of oxygen, according to the old scale, at 100, and silica = 510.

Ball Engine Co. send us the three diagrams, A, B and C, which we publish herewith, illustrating the action of one of these governors, and the results attained are certainly quite remarkable. Before speaking of them at length, however, the construction of the governors must be mentioned. The cuts show the form of construction used for single-valve automatics, in which the governing is affected by moving the eccentric across the shaft. To understand the application of the theory to a form of governor which at first glance is of quite a common form, a close inspection of the cuts is necessary. The pulley itself is made to form a part of the governor, and is mounted loosely on the hub of an arm which is keyed to the shaft. This fixed arm has a stud at each extremity, on which a pivoted lever is placed, shown in Figs. 1 and 3. The inner ends of these levers are attached to the weights and springs, and the outer ends are connected by links to the arm of the pulley or driving wheel, and are the means by which the wheel itself is driven. Thus it will be seen that the governor is placed between the engine and the work which is being performed, and that it not only transmits all the power, but is also constantly weighing the power transmitted. This weighing of the load is made to act directly on the steam supply through the eccentric. The weight and springs provide the necessary stability, and the resistance of the load is only introduced in sufficient quantity to correct the inherent defects of all governors depending solely on changes of speed for power to act. In external form, as we have

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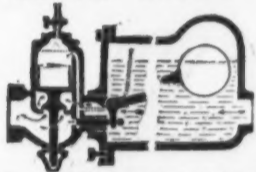
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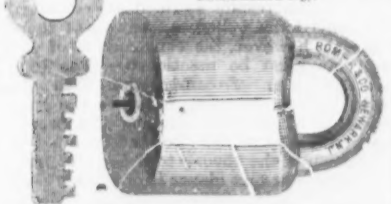
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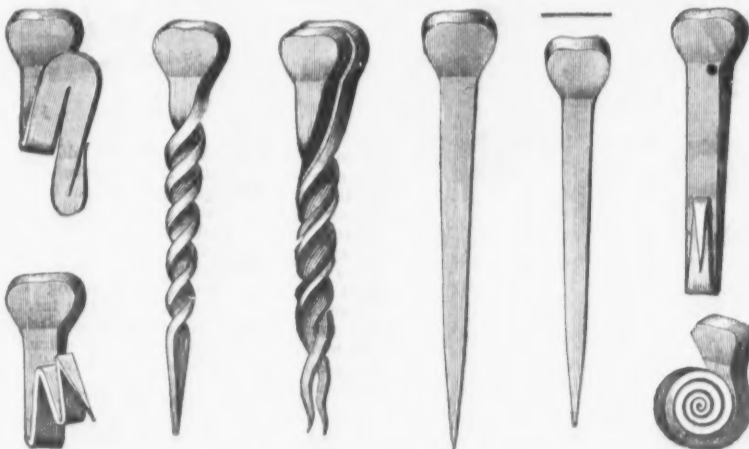
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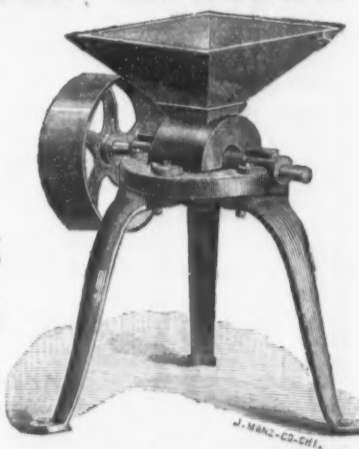
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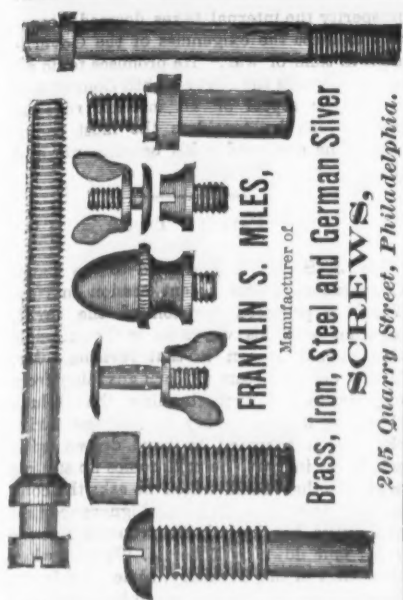
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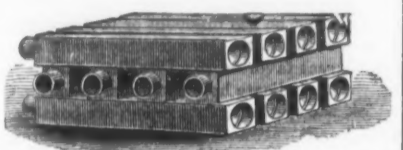
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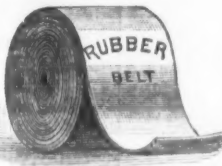
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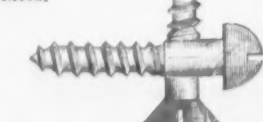
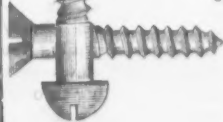
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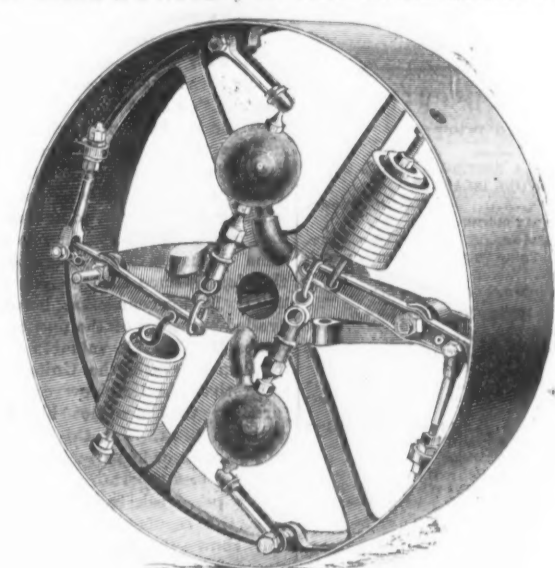
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said, the governor presents a familiar appearance. Fig. 1 is a view from the outside of the engine; Fig. 2, a view from the inside. Fig. 3 shows the inside with the eccentrics detached, while in Fig. 4 the eccentrics appear in their proper relations with the ball and socket joint. The main eccentric has an oblong shaft opening, and is suspended by a pin on an arm, giving it a pendulum-like motion backward and forth across the shaft. Mounted loosely on the shaft outside of this eccentric is a secondary ec-

the engine there may be a slight disturbance detected, caused by the shock. It is impossible, however, to see where it was thrown off. Diagram C is a curiosity in its way, and was taken to illustrate the capabilities of this form of governor, which was adjusted to accelerate the speed of the engine under a load and reduce it when light. In this case the duration of the load is clearly marked by the greater speed which was evidently picked up in three revolutions. This is the demonstration which the manu-



A Novel Governor.—Fig. 3.—Governor with Eccentrics Removed.

centric, the ring of which engages a stud in the side of the main eccentric, so that as this secondary eccentric oscillates forward and backward on the shaft, the main eccentric is made to swing and thereby vary the steam supply in the usual manner. The secondary eccentric has a sleeve surrounding the shaft, projecting through the oblong hole

facturers give, that the speed is completely under control of the governor between the extreme limits of load and running empty.

Tests of Bessemer Steel.

The Pittsburgh Steel Casting Company have recently made a series of tests and carbon determinations of their refined Bessemer steel, in order to show the uniformity which may be attained in its manufacture. The results of the several tests were as follows:

No. of blow.	Elastic Limit.	Elongation in 1 inch fracture. Per cent.	Tensile Strength.
700.....	Not taken.	52	61,280
701.....	32,272	50	61,448
702.....	34,667	62 1/2	63,200
703.....	33,333	50	64,800

The steel was rolled into boiler plate, was flanged and crimped without showing the least inclination to break. The carbon determinations of 73 separate blows, where the carbon was not to exceed 0.10 and to be as near that as possible, gave the following result, showing that the steel can be produced with regularity:

54 blows below.....	0.10
14 blows below.....	0.10
1 blow below.....	0.12
2 blows below.....	0.12
1 blow below.....	0.11
1 blow below.....	0.14

In spring steel the same uniformity was secured.

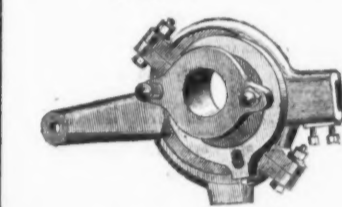


Fig. 4.—The Eccentrics.

in the shaft opening. In the end of this is screwed a nut, which covers the oblong shaft opening and keeps both the eccentrics in contact. The two weights are suspended in such a position that their centrifugal force is opposed by the spring, and the resultant of the opposing forces is transmitted through ball and socket joints to the eccentrics.

The speed diagrams A, B and C, were taken in a rather novel manner. A weight held by a spring in the balance-wheel revolved with it, and by centrifugal force,



Fig. 5.—"A." Speed Diagram from a Common Governor. Load Thrown On and Off.

aided by gravity, vibrated in a vertical direction at each revolution. The extent of these vibrations measured the speed of the engine. Of course when the weight was over the shaft, gravity drew it toward the center, and when in the opposite direction gravity drew it from the center. This constant vibration corresponding with the revolutions is what is represented by the nearly vertical lines, the horizontal motion of the paper, which was constant, giving each line a slight

cured. In 65 blows of this steel, where the carbon aimed at was 0.66, the following results were obtained:

4 blows.....	0.63
10 blows.....	0.65
10 blows.....	0.65
11 blows.....	0.67
15 blows.....	0.68
8 blows.....	0.69

The average being 0.666.

The above experiments prove that by the use of good material and careful manipula-

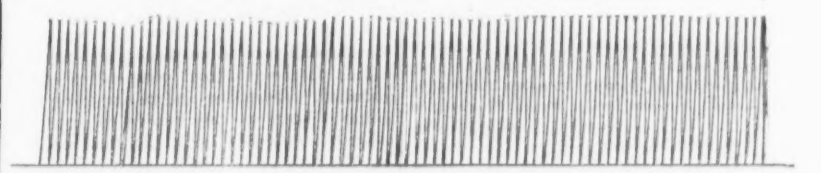


Fig. 6.—"B." Speed Diagram from a Ball Governor. Load Thrown On and Off.

inclination. A pencil attached to the weight drew the lines. The diagrams were all taken from the same engine under the same condition of load, which consisted of a wheel submerged in water, so arranged that it could be lifted out or entirely submerged without interfering with the motion of the engine. The engine itself could be controlled either by the new governor or, at pleasure, by one of the common form, which was one of the most popular in the market and highly

tion, steel can be produced from the Bessemer converter equal in regard to uniformity to either open-hearth or crucible steel.

The iron and general hardware stores in Alexandria seem to have fared remarkably well during the bombardment and subsequent looting by the Arab thieves. A correspondent writes that, while the extensive stocks

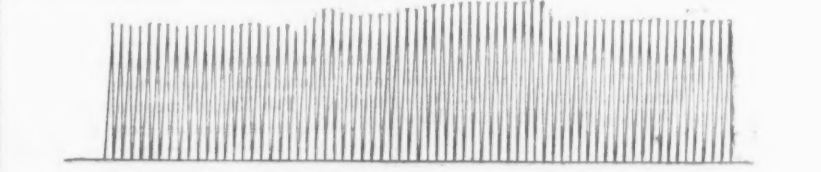


Fig. 7.—"C." Speed Diagram. Increased Speed Under Load.

esteemed for its excellence. Diagram A is a sample of the best work which it could produce under the widest changes of load. In each diagram, near the middle, the load was suddenly thrown on. In A, this point is clearly shown by a marked falling off in the speed. In diagram B there is no evidence of the point where the engine took the load, but where the load was first met by

of fancy drapers and dealers, which mostly belong to French and Greek merchants, have suffered severely, the iron, machinery and hardware stores, which are mostly in the hands of the English, are quite untouched. Several of the English firms have stocks amounting to over £50,000 in value, which have remained intact throughout the whole affair.

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Condition of the Blast Furnaces of the United States, October 1, 1882.

Our regular quarterly report of the condition of the blast furnaces of the country will be found on the next page. It cannot fail to be of interest to our readers who are concerned in the iron trade. In order to avoid any misunderstanding and to point out exactly the scope of the table, the following explanations are given:

1. The divisions of the localities are geographical for the most part, and are not made with reference to the points from which furnace supplies are drawn. 2. The columns "in blast" and "out of blast" only show the stacks from which we have reports, and their footings will not in every case equal the footings of the column of total number. 3. We have included some furnaces that are rebuilding and not yet completed, and others that are building, and in one or two cases some furnaces that have been reported abandoned, since their owners do not report them. In this connection, however, we have omitted ourselves of the new edition of Mr. James M. Swank's valuable "Directory to the Iron Works of the United States," and think that our lists now contain very few furnaces that are not likely ever to go again in blast. For this reason also there will be more or less discrepancy between this and our last report. 4. The column of capacity per week is somewhat in excess of what the regular working of the furnace will show—stoppages, slow working and various other causes, which will readily occur to those interested, combining to reduce the make below the furnace capacity.

In a condensed form the table shows the following (I, in blast; II, out of blast):

CONDITION OF FURNACES OCTOBER 1, 1882.

	I.	II.
Charcoal.....	158	93
Anthracite.....	157	72
Bituminous.....	128	111
Total.....	443	276

The relative condition of the blast furnaces of the country on the 1st of October for five years is as follows:

NUMBER OF FURNACES IN BLAST OCTOBER 1.

	1877.	1878.	1879.	1880.	1881.	1882.
Charcoal.....	89	81	97	153	153	158
Anthracite.....	86	88	128	143	146	157
Bituminous.....	77	80	112	128	134	128
Total.....	252	249	337	424	433	443

NUMBER OF FURNACES OUT OF BLAST OCTOBER 1.

	1877.	1878.	1879.	1880.	1881.	1882.
Charcoal.....	175	186	159	116	119	93
Anthracite.....	140	135	98	66	87	72
Bituminous.....	136	133	90	91	87	111
Total.....	451	454	347	273	293	276

Solid Steel Castings.

In another column we give an extract from a paper read at the Vienna meeting of the British Iron and Steel Institute, by Mr. A. Pourcel, of Terrenoire, on the manufacture of solid steel castings and the methods of annealing and tempering to be applied to the metal, which cannot fail to be highly interesting to a large number of our readers. For years past Terrenoire has assumed the lead in scientific investigation of the properties of steel, and of the relation its chemical composition bears to the treatment of the material requisite for the fullest development of its mechanical properties as a material of construction. There is probably to-day no other steel works in the world where an equal amount of money and labor is expended in experimenting, and when the splendid technical and financial results accomplished there are considered, our own ever-hurried steel manufacturers may well pause for an instant to think whether "experimenting" really "don't pay," and whether the mill, rather than the laboratory, is not really the proper place for scientific investigation wherever practicable and tangible results are desired.

The most marked feature of Mr. Pourcel's paper is to be found in his recital of the methods of annealing and tempering employed at the works, and of the great care and consideration which are bestowed upon the adaptation of these mechanical manipulations to the chemical composition of the material. Reheating and retempering have hitherto been vaguely known to exert considerable influence upon the final product, but the credit seems to belong to Terrenoire of having given us the first positive definition of the proper functions of these manipulations. "The first tempering transforms the crystalline grain of the metal into a fine homogeneous grain; the second determines the molecular equilibrium of the casting, which corresponds to the chemical composition of the metal, and should be more or less intense according as the metal contains more or less than 0.30 per cent. carbon and 0.50 per cent. manganese," is a statement the importance of which can hardly be overestimated. Its correctness is fully borne out by the practical results obtained; but its precision might have been improved by translating *trempe* into "immersion" rather than into "tempering." The English meaning of the word tempering is inseparable from the idea of hardening, which is certainly not intended to be conveyed here, as the immersion in oil of steel at a dull cherry red results in annealing it rather than hardening.

The results obtained thus far fully establish Barba's and Holley's theory, that the effects of successive tempering and annealing are similar to those produced by successive hammerings. As the hammers used for large forgings must always be made relatively much larger than those used for lighter forgings, it is probable that this ex-

penditure of heat and force for the purpose of molecular transformation in larger pieces than those mentioned in the paper, will have to be produced by several immersions into oil from a high oxidizing heat, followed by two or more immersions from lower heats. The narrow limits within which the chemical composition of metal suitable for this work is comprised, render the task of formulating this method dependent only upon the varying thicknesses of the metal. Certainly there is nothing very formidable in this, and a series of experiments tending to establish this formulation will amply repay their cost by the saving to be effected in hammer work.

The importance to steel manufacture in general of the fact thus established—that steel can be given all its mechanical properties by other means than hammering—is so evident that its practical development and application cannot be far off.

Reducing Production in the Finished Iron Trade.

We see that the subject is again broached in Pittsburgh of closing the iron mills during the hot months, the object sought being to reduce stock, keep up prices, and, as one party expressed it, "solving all difficulties between manufacturer and employee, preventing strikes and affording the workmen needed rest and good wages." This custom prevails now in the window-glass business, these works stopping two or three of the midsummer months, which time is occupied in rebuilding the furnaces and preparing for the "fire" of the next year.

This suggestion is by no means a new one, and has frequently been made in past years by workmen at the time when trade has been dull and production far in advance of consumption, but it is not, of course, as every manufacturer will see at once, as practicable in the iron business as in glass, and has really never been seriously considered by the manufacturers. Mr. Jarrett, of the Amalgamated Association, also seems to be in doubt as to the practicability of the scheme. A reporter of the Pittsburgh *Chronicle* represents him as saying in regard to it:

"The practicability of the scheme could only be discovered by trying it. I am not prepared to say it would be a good thing or a bad one. The manufacture of glass and the manufacture of iron are two very different things. The iron trade cannot be regulated as the glass trade can. A glass manufacturer can tell about what quality and what shapes will be in demand at a given season and can regulate his product accordingly. On this account he can easily make arrangements for closing at certain times. With the iron manufacturer it is different. At one time a certain kind of iron will be wanted and perhaps within a few weeks the demand will be for an entirely different kind. Thus there might be serious difficulties in the way of closing at any particular time."

The same paper represents Mr. James I. Bennett as saying:

"I think the fellows who originated that were hard up for something to think about. It is utterly impracticable. Iron will be made whenever there is a demand for it, and just as much as there is a demand for. All these things are governed by laws that no association of workmen or no combination of manufacturers can regulate. The human mind can't grasp all the possibilities of trade. Combinations may turn things out of their natural channel for a while, but they can't keep them there. I suppose you could find fellows, farmers, who would say in July, 'Oh, well, it's too hot to work now, suppose we let our crops stand until December, when it is cooler.' What kind of crops do you suppose they would have by that time? You can find plenty of men who think it is too hot to work at any time. The summer time is the season for building railroads, and they must have the iron they need. If some manufacturer thinks he would like to shut down for the summer, of course these orders will go to some one who is willing to fill them. You can easily see how ridiculous the proposition is. Regarding the decrease in the supply, the idea is also illogical. The supply will always try to keep up with the demand. If the demand is completely filled by ten months' work, of course the mills will stop running from necessity, or lay in stock for future needs. If there are not enough mills to meet the demand for iron, more mills will be built. False restrictions of any kind placed upon trade can only result disastrously in the end."

While we have no doubt that in the future combination is to take the place, in part at least, that has heretofore been held to be the mission of competition, the iron trade will have to be in a far different position from what it is now before this idea, in its details, will be practicable. It might be practicable in the nail trade or in the nut and bolt business, but in a general iron mill where all classes of rolled iron are made, and where the mill has been arranged for supplying the special trade of each season, at that season it will be found well-nigh impossible to work such a combination successfully. In the associations that were formed some years since for the purpose of attempting to regulate prices in the iron trade, the subject of stoppage in times of great abundance of supply, or, at least, of reducing production, was very thoroughly canvassed and found to be impracticable. In the rail business, on the other hand, it has been found practicable, and in 1880, our readers will remember, factories reduced production very materially, running only part time.

The United States District Court for Arkansas has lately rendered a decision of much interest in a case involving the legal responsibility of a mercantile agency for injury done to the credit of a merchant by false reports. The court held that if the agency had acted in good faith, had used all due precaution to obtain accurate information and believed it to be trustworthy, and had communicated the information relative to the house in question only to any of its subscribers interested in knowing the facts

and who had applied for them, then the report is in the nature of a privileged communication, and the agency cannot be held liable in damages if it is proved to have made a false report. But, on the other hand, if the agency sends its reports promiscuously to all of its subscribers, without regard to the fact whether they are or are not interested in knowing the financial standing of the house reported upon, the latter may recover damages for libellous and injurious statements.

Railroad Decisions in Illinois.

The relations of railroads to the people, from whom they obtain their franchises, are likely to be very carefully considered by the courts during the next few years, and from decisions at first perhaps conflicting, something like a law is likely to be created which will be accepted as defining the rights, powers and duties of these corporations. A case has just been decided in Illinois which is of interest to many of our readers. An enactment of 1878 provides as follows:

No railroad corporation shall charge, demand or receive from any person, company or corporation for the transportation, or for any other service, a greater sum than it shall at the same time charge, demand or receive from any other person, company or corporation for a like service, from the same place, or upon like conditions or under similar circumstances; and all concessions of rates, drawbacks and contracts for special rates shall be open to and allowed all persons, companies and corporations alike, at the same rate per ton per mile by carload, upon like condition and under similar circumstances.

The facts of the case which arose under this law were, briefly, as follows: A shipped four cars of brick from Riverton to Randolph, on the Chicago, Burlington and Quincy road, to be used in a building, and was charged \$27 per car freightage, or the regular tariff. B shipped the same number of cars, from the same place to the same point, the brick to be used in an engine house of a railroad grain elevator. The rate charged was \$20 per car. A complained of unjust discrimination. The commissioners held that the law above quoted authorizes special rates. "The local business of the railroads and the public convenience require elevators to complete the transporting power of railroads. Railroad companies generally see to it that elevators are built, that the station may get its share of business. The storekeeper is assured more trade after the elevator is built, and is further assured of its continuance by every safeguard that can be added to it. Elevators are often built by public enterprise, to assure general convenience, the railroad companies hauling the material, usually at reduced rates. It is customary for railroads to give rates to private enterprises in which they are particularly interested, such as on material to make roads to reach their stations, material to construct factories and material to be worked up in them and the product from them. It is reasonable to suppose the additional safety to the elevator, and consequently to the railroad proper, and business convenience justified the company to make special rates in this case. Both shippers are private individuals, but the use to which they applied the brick is different as to their relations to the public. There is a clear distinction that justifies the discrimination contemplated by the law maker. One elevator man should have the same rate as another elevator man for carload lots, and one citizen the same rate as another for the same amount of goods of the same class under like condition and circumstances." In view of all the facts, the commissioners held that the complainant A was not unjustly discriminated against in having to pay \$27 per car for the transportation of bricks, by the special rate given to B in the same class of freight carried the same distance. We cannot but regard the ruling of the commissioners as an absurdity, since special reasons can always be found for special rates which are quite as good as those given in this case.

An opinion was rendered by the Illinois Supreme Court last week in a case involving the question of the power of the State Legislature to regulate rates charged by railroads for freight carried to points outside of Illinois, and whether the act prohibiting unjust discrimination in such rates is not in contravention of the Constitution of the United States. The case is one wherein a 66 per cent. larger rate is charged on a haul from Gilman to New York than on the haul from Peoria to New York, though the distance from Peoria is greater by 86 miles. It was held by the Court that the charge was unjust, excessive, extortionate and unlawful, and, in effect, the Court upholds the authority of the Railroad and Warehouse Commissioners to regulate freight charges from points in Illinois to points outside the State. Considering the way they regulated them in the case first quoted, their discretionary power in interpreting the law seems to us somewhat larger than the Legislature intended.

Hon. Wm. D. Kelley has been unanimously renominated to Congress by the fourth Pennsylvania district, and with him nomination is equivalent to election. He has already served in twelve consecutive Congresses. Though not as yet venerable in years, Judge Kelley is the "father of the House," and by several years the senior in Congressional service and experience in legislation of any other member. In his letter accepting the nomination he expresses his views very plainly on the subject of continuing through seventeen years of absolute peace and large

prosperity the internal taxes deemed necessary to meet the exigencies of the Government in time of war. He promises to do all in his power in the Forty-eighth Congress to secure the repeal of all internal revenue laws, which he considers the most useful service he can render his constituents and the country at large.

A "Parsee" Tariff.

Mr. J. S. Moore presented to the Tariff Commission, at its recent session in New York, a proposed revision of the tariff, together with his views as to the principle that should govern in that revision. Mr. Moore does not seem to learn anything from experience. Notwithstanding the ill-luck that has befallen every one of the tariffs that he is supposed to have drawn up in whole or in part, he still comes up smiling with another tariff which he asks the commission to adopt. In blissful ignorance that the world has moved, he proposes that the rules laid down by Robert J. Walker, when Secretary of the Treasury, some time in the dark ages of the past, should be adopted as the guide in framing the present tariff. One of the absurdities of these principles is that all specific duties should be abolished and ad valorem duties substituted in their place, care being taken to guard against fraudulent invoices and undervaluation. Mr. Moore must either be too innocent or too wise and good for this earth. He certainly would confer a great favor on the Treasury officials if he would indicate how the undervaluations, which the special agents report are constant and persistent with our few ad valorem rates, could be avoided, and with all rates ad valorem it would be simply impossible. Such a tariff should be entitled "An Act to Encourage Smuggling."

We also notice the statement that Mr. Moore has proposed an entire revision of the tariff. He certainly is a very bold man. We do not know of a man in this country, with possibly the exception of Mr. Moore, who would lay claim to sufficient knowledge of the different industries to enable him to frame a complete tariff. We do not believe that Judge French or Mr. James, of the Treasury Department, would do it; nor do we believe there is a protectionist in the country, though he may have spent years in discussing tariff matters, who would dare undertake such a revision. But Mr. Moore, at this time and in the past, does not hesitate to do it. To be sure his work has been rather crude, and has resulted in placing two or three different rates of duty on the same article, but this does not seem to trouble him, and he still acts in accordance with the old saying about a certain class of people rushing in where a much higher class fear to tread.

Commercial Annexation.

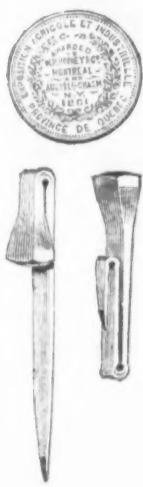
The United States has ceased to make war upon neighboring territory for the purpose of enlarging her boundaries, but through the enterprise of our citizens, and the extension of traffic, we are annexing the population of Mexico, numbering about 10,000,000 inhabitants. We do not yet fully realize this practical fact. More intimate commercial relations, fostered by railroad construction in that republic, are bringing about marvelous changes in the contiguous territories. The trade of Mexico with the United States is already greater than our trade with Russia or Japan, and the rapid development of the last few years promises an indefinite expansion hereafter. The progress of the Mexican people in other respects indicates great possibilities, the national revenue having increased within four years from an average of \$16,000,000 per annum to \$28,627,000 in the year 1881, while the trade of the United States with that country, according to our own official reports, has risen from \$20,800,000 in the year 1879 to \$28,626,000 in the year 1881. Attention is called to some of these facts in a letter written by W. W. Nevins, of this city, in reply to an elaborate article by Hon. John Bigelow, in *Harper's Magazine* for October. Mr. Nevins takes issue with the latter in regard to the stability of the railway system being prosecuted in Mexico, making a clear distinction between those enterprises which have an actual existence and those which are found only on paper. The National, Central, the Sinaloa and the Guaymas roads, he says, have an aggregate mileage of say 1300 miles built, and the system completed "will" have lost—say 4600 miles at \$25,000 per "mile—something over \$100,000,000." As an investment the English road from Vera Cruz to the City of Mexico is not accepted as a fair criterion (although its stock is now quoted in London at 143), its liabilities being \$133,000 per mile, while the Mexican National is bonded not to exceed \$25,000, the Central not to exceed \$32,000 per mile. The subventions are payable in a large measure from the customs dues, which are very like the land subventions to the first Pacific railways. The railroads in Mexico, we are assured, "will also make the customs subventions good."

The views taken by the writer quoted are certainly of a cheering character, and apparently justified, if his promises relating to "the new era" which has dawned upon Mexico are correct. Foreign trade is coming, emigrants are arriving, towns on the frontier are growing, banks are being established, steamship lines authorized, the postal service improved, American machinery is being introduced, coal mines opened, &c. We may hope that nothing will occur to dim

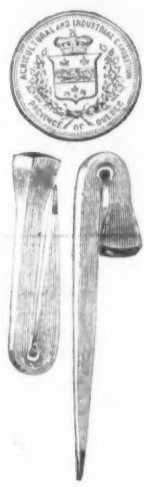
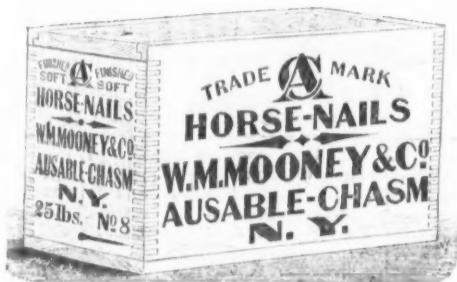
The Metal Industry of Sweden.—According to the data supplied by M. Loumyer, Chargé d'Affaires of Belgium at Stockholm, the number of steel and iron works in Sweden amounted in 1880 to 56, of which there were 47 in Eskilstuna, 1 at Torshälla, 1 in the district of Skaraborg, 1 in that of Wernland, 4 in that of Södermanland, and 1 in that of Örebro. The value of the articles manufactured in that year amounted to 1,265,698 crowns (1 crown = 26.8 cents), being more than in the two previous years, the value in 1878 having reached 1,227,557 crowns, and that in 1879 only 1,171,374 crowns, but less than in 1876 and 1877, when the value of the production reached up to 1,361,340 and 1,314,623 crowns respectively. The number of hands employed at the works amounted to 995. Of foundries and workshops there were 209 in 1880, viz., 103 in the towns, 3 in the villages, and 103 in the country. The value of the production of cast iron, being 400,206 cwt., was 4,628,167 crowns; that of other manufactured articles, 15,823,416 crowns; total, 21,457,585 crowns. There were as many as 8741 hands employed at these works. Of metal and bronze works there were 25 in 1880; 11 of these being at Stockholm and 9 at Eskilstuna. They gave work to 200 men, and turned over an amount of 625,084 crowns.

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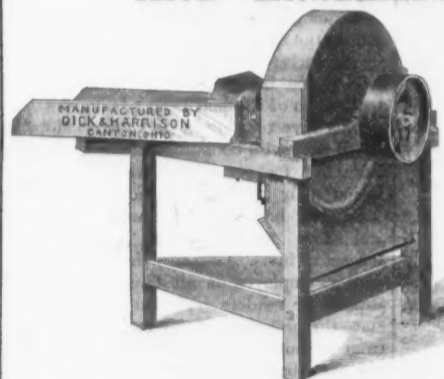
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SCIENTIFIC AND TECHNICAL.

The Circulation of Underground Waters.

At the recent meeting of the British Association Mr. C. E. De Rance read the report of a committee appointed for the purpose of investigating the circulation of underground waters in the permeable formations of England, and the quality and quantity of water supplied to various towns and districts from these formations, to which was added an appendix on the density and porosity of rocks in relation to the water supply. A knowledge of the porosity of rocks was stated to be important as regards the water supply, and in accounting for some of the lithological changes often observed in the strata of the earth. Though the matter had not escaped investigation, the vast volume of water stored in rocks had not been fully realized. The density of the old red sandstone was 2.61, the volume of water absorbed by a cubic foot being over 0.707 gallons and by a square mile 3 feet thick 59,000,000 gallons. Conglomerate beds of the same formation are still more absorbent, being capable of taking in 0.805 gallons per cubic foot or 67,000,000 gallons per square mile 3 feet thick. The millstone grits which lay at the base of the coal measures vary much in different localities, that found in the forest of Dean being the most porous and absorbing 66,000,000 to the square mile three feet thick. Some of the coal measure grits also stored large volumes of water. The Pennant rock, 900 feet thick, in the Bristol coal field was capable of absorbing 12,000,000 gallons in a square mile 3 feet thick, and specimens of magnesian limestone taken from the neighborhood of Bristol gave 86,000,000 gallons, but the carboniferous limestone was quite the reverse, absorbing only 3,500,000 gallons. Oolites were stated to hold vast stores of water, and the rock was used extensively for building purposes. From an analysis of rocks it is clear that nothing in their chemical composition could purify the water, and in order to get rid of organic contamination there must be oxidation and the oxidizing agent was considered to exist in the air absorbed by the water and the air contained in the interstices of the rock.

New Electric Lamps.

Mr. Emile Reynier has recently devised several new forms of semi-incandescent lamps. One consists of eight or nine buttons of carbon built up one above another in a pile comprised between two metal electrodes, the whole being inclosed in a vacuum bulb. The current traversing the set of carbon joints heats them white hot, and the result is a brilliant light. Other patterns of his design are uninclosed in a vacuum. In these the single pencil of carbon impinging on a copper electrode is replaced by two or three carbon pencils. The current is sent through all these and the double or treble points become white hot.

A New Thermo-Chemical Battery.

At the recent meeting of the French Association for the Advancement of Science, Dr. Brard, of La Rochelle, read a paper in which he described a new method of generating electricity by the combustion of a peculiar kind of fire slab. This slab consists of a brick of carbonaceous matter and a brick of nitrate of soda or nitrate of potash, placed together, but separated by a thin sheet of asbestos paper, and both enveloped in a wrapper of asbestos. The carbon brick is formed of about 100 grams of coal dust kneaded into a paste with tar or molasses, and shaped in a mold by heat. The mold gives the brick a pitted surface above, and perforates it with holes through and through from the upper to the under side. Strips of brass or copper are also embedded in the under side of the brick to serve as an electrode for the carbon pole of the electro-generative element. The other brick consists of a mixture of three parts ashes and one part nitrate of potash or soda, melted together and poured upon the pitted surface of the carbon, which, however, is first covered with a layer of asbestos paper. Strips of brass are also embedded in this compound to serve as an electrode. The slab thus formed constitutes a generator of electricity when wrapped in asbestos and placed in a furnace or fierce fire. In such an element the carbon forms the negative plate, and is oxidized, just as zinc is oxidized, in the ordinary voltaic cell; the nitrate of potash being the oxidizing substance. The slab becomes a thermo-chemical battery, and Dr. Brard states that an electric current is obtained strong enough to actuate an ordinary electric bell. By connecting several of these elementary slabs after the manner of a voltaic battery, a more powerful current may be obtained.

The Efficiency of Washed Coal.

Though it is generally conceded now that wet bituminous coal will not make as large a quantity of steam in a boiler as dry coal, there are few figures to substantiate this. There have been firemen, and there are some now, perhaps, who insisted that their coal yielded better results after it had been liberally moistened than when dry, but of late that idea has lost ground, and, as a general rule, has been condemned. A series of tests has recently been made at Bochum, Germany, which offers facts in place of theoretical considerations. A quantity of washed slack, holding 18 per cent. of water and 9.9 per cent. of ash, evaporated 5.7 pounds of water per pound of fuel, while the same coal, with only 3 per cent. of water, made from 8 to 8.5 pounds of steam. Making due allowance for moisture by reducing to a standard of like quantities of coal free from moisture, there is found to be a direct loss by using wet coal of 14 per cent.

The Conductivity of Wire.

At a recent meeting of the British Association, Prof. George Forbes read an interesting paper on some experiments undertaken by him to ascertain whether or not it was true that a wire of twice the sectional area would convey an electric current of twice the intensity. It might be expected that if one wire would carry a current of one volt, two similar wires would carry two volts. This would be so if the currents were far apart; but Professor Forbes finds that when the

currents are near together the radiating surface has to be taken into account. He finds by experiment that if there is a departure from the law of the square of the diameter, the law is almost proportional to the diameter of the wire. "If," he says, "you can carry a definite amount of current through a wire a millimeter in thickness, without heating it over a temperature of 150°, then if you want to carry a current twice as great through a wire you must have 1 or 2 mm. diameter, i. e., of four times the section." This result has an important bearing on the extension of electric lighting.

Utilization of Old Castings.

Mr. F. Becker, of Neuss, Germany, wishing to utilize an old casting that was too large to take to the cupola and could not be conveniently broken up, hit upon the expedient of building a furnace against it and tapping it off on the spot. Carefully covering the mass with refractory material to prevent the radiation of heat, he lighted a coke fire at one corner, and as soon as that portion melted ran it off into a ladle, and by repetition of this process with the other corners the casting was reduced in size until it could be moved without much trouble. It would seem that there must have been local circumstances preventing the use of dynamite to reduce the casting to smaller pieces, since if this was not the case it would appear that an unnecessary amount of labor had been expended in achieving the end aimed at.

Hoskin's Hydrocarbon Blow-Pipe and Furnace.

Assayers, chemists, jewelers, plumbers and other artisans who are frequently called upon to use high temperatures on a small though working scale, will find Hoskin's hydrocarbon blow-pipe and furnace a most convenient assistant, which may be used at all times and is easily manipulated. The apparatus consists essentially of an ordinary force pump, at the bottom of which is a valve which closes automatically upon releasing the pressure from the pump. The air from the pump is forced into a tank filled with about 2 quarts of gasoline and issues through a burner. Communication between the latter and the tank is established by means of the pipe. The latter is provided with a check valve, by means of which this communication may be cut off when desirable, and the intensity of the blast may be regulated from the heat of an ordinary Bunsen burner to that required to fuse cast iron. The burner is separate from the furnace, and may be used as a blast lamp for other purposes, and as all the passages in the burner are perfectly straight, they can be easily cleaned. The burner is thus preferable to the curved and coiled devices frequently used for similar purposes. The blast is directed into a furnace containing a crucible, in which the material to be heated is placed. The complete apparatus, crucible, furnace, muffle furnace and blow-pipe occupy a surface of about 3 feet by 18 inches, and is constructed particularly with regard to portability, space and light weight. The consumption of fuel is naturally subject to so many conditions that positive data cannot be given, but it is stated that in ordinary effective operations one gallon will burn from six to seven hours. The apparatus is manufactured by William Hoskin, of Chicago, Ill., and is claimed to have given very satisfactory results.

Manufacture of Steel Dies.

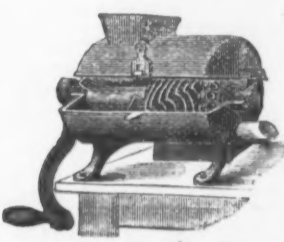
Dies for stamping out small parts under the steam hammer are now made by cutting out the recess to the required shape from a steel block, a process which requires a great deal of time and considerable skill. A method of producing them more quickly and cheaply has, however, recently been communicated to the Liège Association of Engineers by M. Champney, and may not be without interest to our readers. M. Champney makes an impression on a heated block of steel, kept from contact with the air, by means of a punch which is an exact copy of the part which it is desired to reproduce. The die consists of a small cylinder of cast steel with a slightly conical end, and which is intended to be compressed when the recess is formed, the dimensions of the cone being determined by the experience of the operator. The die is heated on a plate covered with a cap of refractory material, under which are poured, at the moment of placing in the furnace, a few drops of oil. When hot it is taken to the steam hammer with the plate and cap, which continue to prevent the admission of air. It is allowed to fall into a central cylindrical recess, formed in a steel disk which is placed upon the anvil. The cap of the refractory material is then taken off and the punch fitted to the upper block is allowed to descend. The steel disk placed upon the anvil is provided with an obturator, which closes at the instant the small block of heated steel descends into the recess of the disk. This obturator is a simple slide-valve, which opens and shuts easily; it is provided with a tail, which extends in a vertical direction along the side of the hammer. The latter, in its fall, touches this tail immediately before reaching the disk, and in this way opens the slide-valve, so that the impression is obtained while absolutely free from contact with the air. As it is important to prevent the hammer-head from rebounding, which would take off from the sharpness due to a single blow, M. Champney has devised a trigger arrangement which, placed upon the anvil, accomplishes the object. Dies made in this way appear to be not only cheaper, but also more durable than by the old tedious method.

We understand that two large works are to be erected by German firms in Russia. One of them has been previously mentioned in our columns, and will be that of Messrs. Siemens & Halske, of Berlin, who will manufacture all articles necessary for the working of electric telegraphs and other electrical arrangements. The second will be erected by Messrs. Becker & Co., of Schalke, Westphalia, who own large forges, rolling mills, wire-drawing works, tin-plate works, wire-cable works and a wire-tack manufactory, and who are large exporters to Russia. In order to avoid the high import duties on their products, they contemplate the erection of similar works near the sea and on the German frontier.

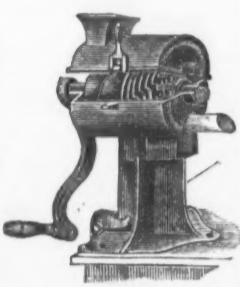
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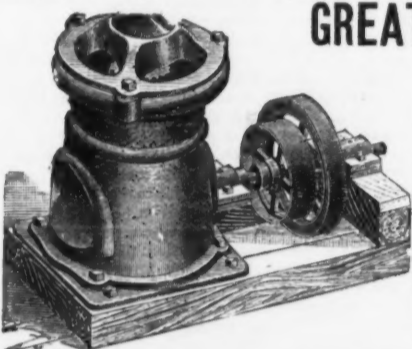
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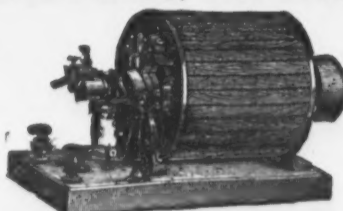
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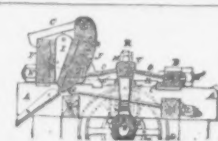


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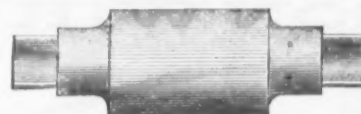
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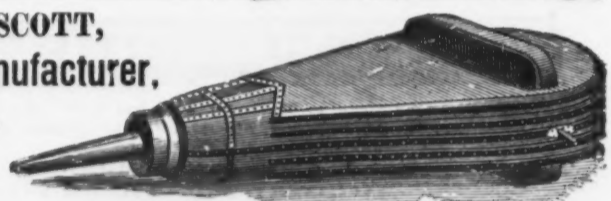
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Southern States C. I. and S. Co., Tenn.
Sewanee Furnace Co., Tenn.
James C. Warner, Rising Fawn, Ga.
Ohio Iron Co., Zanesville, O.
Blount Furnace Co., Ala.

A Year's Work with the Emery Testing Machine.

In our issue for last week we gave attention to some portions of the report of Col. T. S. Laidley, commanding Watertown Arsenal, and in charge of the United States testing machine there located. We present at this time the report of Walter G. Berg, C. E., on quality and character of wrought iron in test bars, taken from irons L and S for comparative tests of extra-refined and double-refined iron, which forms an important part of the general report. In his preliminary remarks Mr. Berg says:

In this report the iron slab formed by rolling out the puddle balls will be called "muck iron"; the muck iron, heated and re-rolled, will be called "reheated iron"; the reheated iron, reheated and re-rolled, will be called "double-reheated" iron. The usual practice at mills distinguishes three grades of iron formed from the same muck bar, according to the amount of refining (i. e., reheating and re-rolling) the mass of the iron is subjected to, viz.:

1. *Single Refined.*—The pile from which the definite iron is rolled is formed entirely of muck slabs.

2. *Extra Refined.*—The pile from which the definite iron is rolled has reheated tops and bottoms, and muck slabs for intermediate layers. (In some cases, especially large piles, also reheated centers.)

3. *Double Refined.*—The pile from which

Time in rolls —; 9 reductions (2 rough box, 2 rough gothic, 3 box, 2 flat finishing) in 12 passes.

IRON S.—PASSAIC ROLLING MILL CO.

1. *Ores and Pig Iron.*—This iron is formed by a mixture of different qualities of pig iron in the puddling furnace at the mills, viz.: Musconetcong iron, Stanhope, N. J.; Poquest iron, New York; Thomas iron, Lehigh Valley, Pa.; imported English iron.

2. *Muck Iron.*—Double puddling furnace, anthracite coal, cold blast. Port Henry ore in blocks for fixing; no paste used. Time in furnace, 1 hour 15 minutes to 2 hours. Puddle balls reduced by Burden squeezer. Blooms rolled on 3 high, 18 inches train. For $2\frac{1}{2} \times 3\frac{1}{4}$ inches muck slabs the bloom was 45 seconds in rolls, and received to reductions (8 gothic, 2 flat). The thickness of muck slabs averaged $\frac{3}{4}$ inch full.

3. *Reheated Iron.*—The piles for forming $2\frac{1}{2}$ -inch and $3\frac{1}{4}$ -inch reheated slabs were 6 inches wide, 6 inches high and 20 inches long; 6 layers high, entirely of $2\frac{1}{2}$ -inch and $3\frac{1}{4}$ -inch muck slabs, lapped. Time in rolls, 14 minutes; 12 reductions (4 rough box on 2-high 18-inch train, 6 rough gothic, and 2 flat finishing on 3-high 18-inch train) in 13 passes. The thickness of reheated slabs averaged $\frac{3}{4}$ inch.

4. *Extra-refined Iron.* (a.) Three test bars 3×1 inch \times 1 foot; mark: S 11, 12, 13.—Piles, 6 inches wide, $6\frac{1}{2}$ inches high, 25 inches long; 7 layers high; tops and bottoms, 6-inch reheated slabs; intermediates, $3\frac{1}{2}$ -inch and $2\frac{1}{2}$ -inch muck slabs, lapped.

The Mineral Wealth of India.

The mineral resources of India and their development formed the subject of an interesting paper recently read before the Society of Arts, London, by Mr. V. Ball. Various hypotheses regarding the mineral riches of this country have been advanced at different times, but few, if any, attempts have been made to bring together the widely-scattered information relating to any single mineral production, and to this fact, in a great measure, due the unreliability which must be placed upon the opinions sometimes expressed as to the values of different products. Mr. Ball confidently states that the highest peaks of the Himalayas, under perpetual snow, undoubtedly contain enormous

percentages of silver. Copper ores occur in several of the older Indian formations, being sometimes found in regular lodes, but perhaps more commonly disseminated irregularly in the rocks which include them. In Southern India, in Bengal, in Rajputana, in Afghanistan, and in the Himalayas, as well as in some other regions, copper ores were formerly mined to a large extent, this being shown by the magnitude of the ancient workings, many of which were deserted long before they had a historian. Although tin ores occur in various parts of the Indian Peninsula, there is, at present, no evidence that they are of sufficient abundance to insure successful mining operations. With the exception of iron, there is no metal of which the ores appear to have been worked to so large an extent as those of lead. Galena, associated with small quantities of silver, is most commonly found, and the percentage of the latter metal is, in some cases, so high that it seems probable that the ancient workers devoted their attention to the extraction of silver rather than to that of the lead. It is certain, however, that in some of the localities considerable quantities of lead were produced, as for instance in Ajmir, where the mines were of great extent, and had in 1830 the appearance of having been worked for centuries. Traces of zinc ores have been found in several parts of India, but have, however, been worked in only one locality. The principal ore is smitsonite or zinc carbonate, which was reduced in ingeniously contrived retorts. There are reasons for supposing that the same ore occurs in one of the Karnul galena mines, where it was probably treated as refuse, its character not being known to the native miners.

The process of iron manufacture as practiced by the natives has much interest, both historical and technical, connected with it. The costly experiments which have been made have served to prove several facts, of which the principal are: First, that materials suitable for the manufacture of excellent iron do exist; second, that while, in some of the localities chosen, the manufacture could not possibly have been conducted with success, in others the conditions were more favorable, and that, in consequence of the information so obtained, no hesitation need be felt in the selection of the best of localities hereafter should the industry be again started; third, that the iron produced at one locality will be applicable only to certain special purposes, and that from the sameness of the materials employed, iron, but of a limited number of varieties, can be produced; fourth, that the margin of profit upon local manufacture will, under the most favorable circumstances, be a very narrow one—so narrow as to be subject to be swept away with the oscillations in prices in the English market.

Of the other metals found in India, besides those above mentioned, the most important are platinum, cobalt, manganese and chromium. The occurrence of mercury is doubtful. Salt has hitherto enjoyed the position of being, in reference to the Indian revenue, by far the most important mineral production of about \$35,000,000. It appears that an enlarged system of mining would be of incalculable benefit to the native community, and would afford suitable means of employment for a rapidly increasing class, whose future should be a matter of grave concern to the Indian authorities.

Petroleum Wells in Russia.

The increasing importance of the petroleum wells of Baku, on the Caspian Sea, has led to a project being set on foot for connecting this place with Batoum, on the Black Sea, by means of pipes in order to avoid the difficulties and dangers of the railway transportation of the oil. It is proposed to pump the petroleum into tank steamers at Batoum, and very sanguine expectations are entertained as to the possibility of successfully competing with the American petroleum imported into Europe. The Baku oil territory is described as having an area of not less than 1200 square miles. Its elevation above the level of the Caspian Sea varies greatly. The Caspian is 86 feet below the level of the ocean. The general aspect of this region is that of a barren desert, deprived of water and vegetation, checked here and there with dried-up salt lakes, natural outflows and pools of oil, gas wells and exhausted mud volcanoes. Even on the surface of the Caspian natural outflows of petroleum and gas may be seen at certain places. The boring operations are mostly carried out on the peninsula of Aspheron, where the potential productiveness is considered to be much greater than that of our petroleum regions. Comparing the results achieved in the two countries on the one side and the average depth and total number of wells on the other, it is stated that the natural petroleum riches of Baku have no parallel in the world. The lands are partly purchased and partly held by lease. The former comprise 680 desiatines, or 1836 acres, sold by the Crown to different parties by public auction for the sum of about \$1,500,000. For certain plots as much as \$17,500 per acre has been paid. The yearly rent for leased Crown land is only about \$1.87 per acre. These lands were supposed to be worthless at the time, but the contrary has been proven since, and they now form a subject of wild speculation among the numerous moneyless holders very detrimental to legitimate business. A tract of the most valuable petroleum land, with an area of 220 acres, has been granted to a certain number of high officials as a token of imperial favor. In 1871 the number of wells sunk by way of drilling was 17. The total number now is above 375. The average depth of borings is 350 feet; the deepest well, 637 feet, with a diameter of from 10 inches to 14 inches. The number of unproductive wells from natural causes is comparatively small, but a great many wells are abandoned for want of means or skill to continue the boring, or still more frequently on account of the extremely low price of crude petroleum.

Flowing wells, yielding from 2000 to 4000 barrels (eight pools or forty gallons to the barrel) daily, and pumping wells yielding from 300 to 600 barrels daily are said to be of common occurrence. The total quantity produced in 1873 was 500,000 barrels, and in

1881 this rose to between 3,000,000 to 4,000,000, besides immense quantities of crude petroleum, which was wasted at the place of production for want of adequate means of tankage and transportation. The export of the different petroleum products from Baku by sea amounted to 2,046,000 barrels in 1881, against 1,702,200 in 1879. It will thus be seen that the output has been steadily increasing, and it is not improbable that the special inducements offered by a pipe connection between Baku and Batoum will lend an additional stimulus to the already extensive industry.

French Trade for Seven Months.

The commerce of France shows a slight improvement. According to the Board of Trade returns just published, exports as well as imports have increased considerably during the past seven months. The table is worth quoting:

	1882.	1881.
Imports.	France.	France.
Food stuffs.....	921,802,000	1,004,825,000
Raw materials.....	1,137,678,000	1,283,850,000
Manufactured goods.....	491,655,000	172,858,000
Miscellaneous.....	162,817,000	149,460,000
Total.....	2,815,952,000	2,746,003,000
Exports.	France.	France.
Food stuffs.....	478,081,000	471,429,000
Raw materials.....	3,168,700,000	3,422,231,000
Manufactured goods.....	1,056,079,000	919,217,000
Miscellaneous.....	94,480,000	98,381,000
Total.....	2,092,929,000	1,811,450,000

It will be seen from these figures that, if the total imports exceeded the exports by more than 800,000,000 francs during the seven months of the present year, the excess during the same period of last year was as much as 913,000,000 francs. This is a small amelioration, chiefly due, however, to the good harvest. At the same time it must be noticed that, while the imports of manufactured goods rose from 307,000,000 francs in 1881 to 401,000,000 francs in 1882, the exports from the same articles increased from 919,000,000 francs to 1,056,000,000 francs. The returns on the whole are favorable, but it must be borne in mind that the working of the new treaty régime has not yet had time to make its effect fully felt.

Telegraphy in Japan.—The Japanese

telegraph net which was commenced in 1871, embraced at the beginning of last year 3229 miles of road, and 9345 miles of wire. The total number of telegrams forwarded during the year amounted to 1,272,756, of which 96 per cent. were written in the Japanese tongue. Japanese having no alphabet of individual letters, it has been necessary for telegraphic purposes to make up combinations of Morse characters, representing the sounds of each of the syllables contained in the so-called Katakana. For this purpose letters of the international code have been used, and been supplemented by others made up of fine dots and strokes, which represent a total of 47 signs, minus the figures. The alphabet that had been formed in that way answered well enough for about eight years. The young Japanese operators, who are now taken from a school of telegraphy, are taught to speak and write English and French, and generally receive a primary education similar to that given in England. The average charge for the conveyance of 20 Japanese characters over a distance of 60 miles is somewhat less than 2 cents. In 1880 there were open to the public 112 offices, besides which there were 70 in connection with the various departments of the State, the railways and the police stations. There are now in use 343 Morse apparatus, 26 Block instruments with 1 needle, and 29 telephones on the Bell system. In the school of telegraphy there are 71 instruments of various descriptions for practicing purposes, and in the Straits of Shimonoski 5 cables have been laid.

Coal in Sweden.—In Sweden coal has

as yet been met with only in the most southern province, Scania, and that only at two points at which the deposits have been worked, with long interruptions, since the middle of the Eighteenth Century. At Hoganas, in the neighborhood of the point for a long time considered as the northern limit of the coal district of Scania, the extraction of coal, commenced in 1797, has been the most remunerative. Two seams have been worked, one at a depth varying, according to a regular dip, from about 10 to 195 feet, and from 6 to 17 inches thick, the other being about 79 feet lower and 4 feet 8 inches thick. Swedish engineers acknowledge that they are not thoroughly acquainted with the extent of this coal formation, though numerous bore-holes have been put down and shafts sunk. The measures contain coal of inferior quality, as well as fire-clay, the working of which is highly remunerative. In 1876 there were in Sweden seven centers of working, and in the present year there are 12; yet, notwithstanding the progress made in mining, importations of coal and coke from foreign sources continue to increase at a considerable rate.

The growing importance of Antwerp for the English and Continental passenger and freight traffic has led to the foundation of what will ultimately be a new town in the county of Sussex, England. The present accommodations at Harwich have been found inadequate for the increasing trade and the Great Eastern Railway Company have consequently erected a splendid new dock about three-quarters of a mile from Harwich, where its vessels will land passengers and freight in the future. The new port has been named Parkeston. The dock is 1800 feet long, and is provided with warehouses 1400 feet long and 60 feet broad. The erection of a railway station hotel, bonded stores, customs offices, &c., is contemplated, and Parkeston will in the future be the port through which a large traffic, not only between London and the Continent, but between the middle and north of England and the Continent, will pass. The railway company has completed certain extension lines which will bring the port in direct communication with some of the principal manufacturing centers of Great Britain.

TABULATED RESULTS OBTAINED WITH SINGLE AND DOUBLE REFINED ROLLED BARS.
(Bars from the Elmira Iron and Steel Rolling Mill Company; distinguishing letter, L. Bars from the Passaic Rolling Mill Company; distinguishing letter, S.)

No. of Test.	Mark on Bar.	Kind of Iron.	Dimensions.		Sectional Area.	Elastic Limit per square inch.	Ultimate Strength per square inch.	Elongation in 80 inches.	Contraction of Area.	Appearance of Fracture.
			Width.	Thickness.						
			Inches.	Inches.	Sq. in.	Pounds.	Pounds.	Per cent.	Per cent.	
773.....	L 1	Single refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 95%; granular, 5%
774.....	L 2	Single refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 95%; granular, 5%
775.....	L 3	Single refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 95%; granular, 5%
776.....	L 4	Single refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 95%; granular, 5%
777.....	L 201	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
857.....	L 202	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
972.....	L 203	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
973.....	L 204	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
974.....	L 205	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
975.....	L 206	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
976.....	L 207	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
977.....	L 208	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
978.....	L 209	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
979.....	L 210	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
980.....	L 211	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
981.....	L 212	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
982.....	L 213	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
983.....	L 214	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
984.....	L 215	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
985.....	L 216	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
986.....	L 217	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
987.....	L 218	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
988.....	L 219	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
989.....	L 220	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
990.....	L 221	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
991.....	L 222	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
992.....	L 223	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
993.....	L 224	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
994.....	L 225	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
995.....	L 226	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
996.....	L 227	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
997.....	L 228	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
998.....	L 229	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%
999.....	L 230	Double refined....	3.03	1.01	3.06	28,500	52,710	18.4	31.3	Fibrous, 100%

the definite iron is rolled is all reheated iron.

In some mills muck iron is called No. 1 iron; single-refined iron, No. 2; double-refined iron, No. 3; extra-refined iron, No. 2 and No. 3 mixed.

IRON L.—ELMIRA IRON AND STEEL ROLLING MILL CO.

1. *Ores and Pig Iron.*—The pig iron from which iron L is made is from blast furnace under same management as the rolling mill. The ores are: Jefferson, N. Y.; Lake Superior, Center County, Pennsylvania, Champlain. Thus the pig at puddling furnace is all of the same character, the mixing being done at blast furnace. The only distinction made at puddling furnace is the grade of the pig, due to the different periods of the same cast.

2. *Muck Iron.*—Puddling furnace lined with blocks of Port Henry ore. Fixing paste composed of about one part Humboldt ore to four parts Lake Superior. Puddle balls always shingled, except during repairs, when Burden squeezer used. The resulting muck bar is piled in yard without any distinction as to quality. Usual sizes, $3 \times \frac{3}{4}$, $4 \times \frac{3}{4}$ inches; special sizes, $6 \times \frac{3}{4}$, $7 \times \frac{3}{4}$ inches.

3. *Reheated Iron.*—The piles for forming 3-inch and 4-inch reheated iron slabs were 6 inches wide, 7 inches high over all, 20 inches long, and formed entirely of muck iron; eight layers high, each of two $3 \times \frac{3}{4}$ inch muck slabs. The piles remained about 1 hour and 30 minutes in the heating furnace (soft coal) and passed through rolls (2 high, 18-inch train) in 24 minutes, receiving 11 reductions (2 rough box, 5 rough gothic, 4 flat finishing) in 13 passes. The piles for forming 6-inch and 7-inch reheated iron slabs were 7 inches wide, 7 inches high, 29 inches long, and formed entirely of muck iron; eight layers high, each of 3-inch and 4-inch muck slabs, lapped. The thickness of reheated iron slabs averaged $\frac{3}{4}$ inch full.

4. *Extra-Refined Iron.*—(a.) Four test bars 3×1 inches \times 10 feet; mark: L 1, 2, 3, 4.—Piles 7 inches wide, 7 inches high, 21 inches long; 9 layers high, tops and bottoms 7-inch reheated slabs; intermediates, 3-inch and 4-inch muck slabs, lapped. Time in furnace, 1 hour 10 minutes. Time in rolls, 3 minutes; 12 reductions (2 rough box, 6 rough gothic, 4 flat finishing) in 14 passes. (b.) Three test bars $5 \times 1\frac{1}{4}$ inches \times 10 feet; mark: L 5, 6, 7.—Piles 7 inches wide, 8 inches high, 54 inches long; 10 layers high, tops and bottoms 7-inch reheated slabs; intermediates, 2-inch and 4-inch muck slabs, lapped. Time in furnace, 1 hour 10 minutes. Time in rolls, $3\frac{1}{2}$ minutes; 9 reductions (2 rough box, 2 rough gothic, 3 box, 2 flat finishing) in 13 passes.

5. *Double-Refined Iron.*—(a.) Four test bars 3×1 inches \times 10 feet; mark: L 201, 202, 203, 204.—Piles 7 inches wide, 7 inches high, 21 inches long; 9 layers high, entirely of reheated iron, tops and bottoms 7-inch reheated slabs; intermediates, 3-inch and 4-inch reheated slabs, lapped. Time in furnace, 1 hour 15 minutes.

Time in furnace, 1 hour 15 minutes; time in rolls, 11 reductions (7 rough gothic, 4 flat finishing) in 12 passes. (b.) Three test bars $5 \times 1\frac{1}{4}$ inches \times 10 feet; mark: S 15, 16, 17.—Piles, 8 inches wide, 8 inches high, 32 inches long; 8 layers high; tops and bottoms, 8-inch reheated slabs; intermediates, layers of one $3\frac{1}{2}$ -inch and two $2\frac{1}{2}$ -inch muck slabs, lapped. Time in furnace, 1 hour 35 minutes; time in rolls, 24 minutes; 10 reductions (6 rough box, 4 flat finishing) in 11 passes.

5. *Double-refined Iron.* (a.) Three test bars 3×1 inch \times 10 feet; mark: S 211, 212, 213.—Piles, 6 inches wide, $6\frac{1}{2}$ inches high, 25 inches long; 7 layers high, entirely of reheated iron; tops and bottoms, 6-inch reheated slabs; intermediates, $2\frac{1}{2}$ -inch and $3\frac{1}{2}$ -inch reheated slabs, lapped. Time in furnace, 1 hour 15 minutes; time in rolls, 24 minutes; 11 reductions (7 rough gothic, 4 flat finishing) in 12 passes. (b.) Three test bars $5 \times 1\frac{1}{4}$ inches \times 10 feet; mark: S 215, 216, 217.—Piles, 8 inches wide, 8 inches high, 32 inches long; 8 layers high, entirely of reheated iron; tops and bottoms, 8-inch reheated slabs; intermediates, 6-inch and $2\frac{1}{2}$ -inch reheated slabs, lapped. Time in furnace, 1 hour 45 minutes; time in rolls, 2 minutes 45 seconds; 10 reductions (6 rough box, 4 flat finishing) in 11 passes.

The following is the account given in the report of the nicking and bending tests of muck and reheated slabs at mills:

IRON L.—ELMIRA IRON AND STEEL ROLLING MILL CO.

1. *Muck Iron.*—Three-inch muck slabs, nicked lightly on one side and bent back cold by blows of a sledge, showed average fracture, $\frac{3}{4}$ fibrous, $\frac{1}{4}$ fine crystalline. Same bars bent cold without nicking, skin cracked at 45°, crack opened and tore across face at 90°, broke clean open at 135°, and flattened down on itself, showed very tough, tenacious material; fracture fibrous, with crystalline spots and streaks.

2. *Reheated Iron.*—Three-inch reheated slabs, nicked light on one side and bent cold, showed mainly fibrous, interspersed with crystalline streaks and spots. Same bars bent cold without nicking, skin cracked at 45°, crack opened and tore across face at 90°, broke clean open at 135°, and flattened down on itself, showed very tough, tenacious material; fracture fibrous, with crystalline spots and streaks.

IRON S. (PASSAIC ROLLING MILL CO.)

1. *Muck Iron.*—Two and one-half-inch muck slabs, nicked on one side, light and bent cold, snapped off and showed nearly throughout fine crystalline fracture, with a few fibrous streaks. Bent cold without nicking, snapped short off at 30°; fracture over one-half fine crystalline, remainder fibrous streaks and spots. Three and one-half-inch muck slabs, nicked on one side and bent cold, showed fibrous, interspersed with crystalline places. Bent cold without nicking, cracked open at 20°, broke short off at 45°; fracture fibrous, with crystalline places.

stores of mineral wealth, the development of which requires only the application of scientific knowledge. India has enjoyed a wide reputation since the earliest times as being a land in which all, or nearly all, kinds of precious stones were to be found. It is, however, not in this direction alone that the country is of importance,

Louis and the West large. Responsibility
 le. Address W. M.,
 Care *Age of Steel*, St. Louis, Mo.

IMPORT INTO THE UNITED STATES.

Jan. 1 to Aug. 1, 1882.

	Pounds.	Value.
Total import.....	3,472,451	\$10,926
Re-export.....	3,472,451	18,116
Net import.....	2,958,117	\$9,804
Equal to tons.....	7,399	

Jan. 1 to Aug. 1, 1881.

	Pounds.	Value.
Total import.....	4,486,576	\$156,817
Re-export.....	3,958,058	23,273
Net import.....	3,980,618	\$133,544
Equal to tons.....	10,177	

IMPORT INTO THE UNITED STATES.

Jan. 1 to Aug. 1, 1882.

	Pounds.	Value.
Spelter.....	15,745,444	\$642,315
Sheet zinc.....	3,310,258	155,174
Total.....	19,055,702	\$797,489
Re-export, sheet zinc.....	7,804	395
Net import.....	19,048,898	\$797,094
Equal to tons.....	8,500	

Jan. 1 to Aug. 1, 1881.

	Pounds.	Value.
Spelter.....	1,775,941	\$44,590
Sheet zinc.....	1,375,497	59,900
Total.....	3,151,438	\$104,490
Re-export, sheet zinc.....	1,131	1,009
Net import.....	2,324,857	103,487
Equal to tons.....	1,131	

Antimony.—The market remains unaltered at 13¢ @ 13½¢, Cookson, and 11¢ @ 11½¢, Hallett.

IMPORTS

Of Hardware, Iron, Steel and Metals into the Port of New York, for the Week ending October 11, 1882:

Hardware.

Order.	Pig, tons, 1040
Baker Hermann & Co.	Cutlery, cs., 16
Cutlery, cs., 16	Spiegel, lot, 1
Spiegel, lot, 1	Wire rods, bbls., 4906
Wire rods, bbls., 4906	Rails, 3017
Rails, 3017	Ore, tons, 6218
Ore, tons, 6218	Pig, kg., 350,278
Pig, kg., 350,278	Sheets, pgs., 50
Sheets, pgs., 50	Bars, 320
Bars, 320	Spiegel, kg., 762,355
Spiegel, kg., 762,355	Scrap, kg., 348,145
Scrap, kg., 348,145	Field Alfred & Co.
Field Alfred & Co.	Mdse., cs., 21
Mdse., cs., 21	Cutlery, cs., 2
Cutlery, cs., 2	Arms, cs., 2
Arms, cs., 2	Chains, cs., 2
Chains, cs., 2	Old rails, tons, 143
Old rails, tons, 143	Fish plates, bbls., 131
Fish plates, bbls., 131	Cotton ties, bbls., 8200
Cotton ties, bbls., 8200	Sheet, bbls., 317
Sheet, bbls., 317	Hoop iron, bbls., 674
Hoop iron, bbls., 674	Old rails, pgs., 3126
Old rails, pgs., 3126	Plates, bbls., 3
Plates, bbls., 3	
	Steel.
	Abbot Jere & Co.
	Cases, 76
	Bundles, 177
	Baring Bros. & Co.
	Rods, bbls., 6341
	Collins H. E.
	Bundles, 834
	Dodge A.
	Mdse., cs., 2
	Downing, Sheldon & Co.
	Bundles, 221
	Dural H. R.
	Bands, 126
	Great Western Disp. Co.
	Cases, 10
	Bundles, 45
	Plates, 130
	Russell J. Cutlery Co.
	Case, 1
	Struller, Lau & Co.
	Mdse., case, 1
	Temple & Lockwood.
	Bundles, 46
	Bars, 23
	Wagner W. F.
	Bundles, 787
	Cases, 22
	Plates, 50
	Bars, 175
	Order.
	Bands, 120
	Packages, 46
	Forgings, 28
	Bars, 2
	Witte, John G. & Bro.
	Arms, cs., 8
	Cutlery, cs., 8
	Order.
	Gun barrels, 16
	Cases, 3

Iron.

Baird S. F.	Wire rope, reel, 1
Iron nippers, 1	
Baring Bros. & Co.	Wire rods, bbls., 1389
Wire rods, bbls., 1389	Bars, 1812
Bars, 1812	Rods, pgs., 803
Rods, pgs., 803	Pigs, tons, 1760
Pigs, tons, 1760	Rods, bbls., 3741
Rods, bbls., 3741	Brown Bros. & Co.
Brown Bros. & Co.	Wire rods, bbls., 1221
Wire rods, bbls., 1221	Old fish plates, tons, 100
Old fish plates, tons, 100	Broomfield George.
Broomfield George.	Wire rods, bbls., 60
Wire rods, bbls., 60	Coddington, T. B. & Co.
Coddington, T. B. & Co.	Sheet, bbls., 229
Sheet, bbls., 229	Sheet, bbls., 39
Sheet, bbls., 39	Cook & Bradley.
Cook & Bradley.	Beams, 7
Beams, 7	Consulting Bela.
Consulting Bela.	Ore, kg., 300,000
Ore, kg., 300,000	Drexel, Morgan & Co.
Drexel, Morgan & Co.	Ore, tons, 360
Ore, tons, 360	Ironclad Mfg. Co.
Ironclad Mfg. Co.	Cases, 187
Cases, 187	Bundles, 108
Bundles, 108	Lough & Van Romand.
Lough & Van Romand.	Iron sand, cs., 2
Iron sand, cs., 2	Lundberg Gust.
Lundberg Gust.	Bars, 16,777
Bars, 16,777	Bundles, 6
Bundles, 6	Mason John W. & Co.
Mason John W. & Co.	Wire rope, coils, 20
Wire rope, coils, 20	Melssner, Ackermann & Co.
Melssner, Ackermann & Co.	Lot of iron, 1
Lot of iron, 1	Morton, Bliss & Co.
Morton, Bliss & Co.	Beams, 16
Beams, 16	Naylor & Co.
Naylor & Co.	Pig, tons, 333
Pig, tons, 333	Naylor, Benzou & Co.
Naylor, Benzou & Co.	Bars, 257
Bars, 257	Ogden & Wallace.
Ogden & Wallace.	Bars, 235
Bars, 235	Beams, 224
Beams, 224	Beams, 108
Beams, 108	Perkins & Choate.
Perkins & Choate.	Cases, 850
Cases, 850	Pierson & Co.
Pierson & Co.	Hoop iron, bbls., 284
Hoop iron, bbls., 284	Rails, 200
Rails, 200	Spelman, Jr. W. B.
Spelman, Jr. W. B.	Nails, cs., 10
Nails, cs., 10	Raney A. R.
Raney A. R.	Bundles, 128
Bundles, 128	Bars, 57
Bars, 57	ndmuller & Roelker.
ndmuller & Roelker.	Sheets, pgs., 255

EXPORTS

Of Hardware, Iron, Machinery, Metals &c. from the Port of New York, for the Week ending Oct. 10, 1882:

Dutch West Indies.

British Honduras.

Ptm., gals., 2460 \$280

Tacks, cs., 1 31

Cutlery, cs., 4 31

Hdw., pgs., 3 31

Stettin.

Ptm., gals., 13,641 11,000

Elsinore.

Ptm., gals., 17,105 14,500

Danish West Indies.

Wire gds., cs., 1 40

Ptm., gals., 850 110

Copenhagen.

Pumps, pgs., 4 340

Clocks, cs., 1 340

Hdw., cs., 6 210

Christiana.

Ag. imp., pgs., 2 20

Amsterdam.

Sew. ma., cs., 254 5,680

Mf. iron, pgs., 7 75

Ptm., gals., 6000 250

Mach'y, pgs., 2 124

Hdw., cs., 3 124

Hamburg.

Ptm., gals., 1,804,311 1,642,525

Sew. ma., cs., 1,157 21,570

Clocks, pgs., 15 116

Guns, cs., 5 819

Bullets, cs., 13 819

Cutlery, cs., 2 124

Valves, bxs., 15 1,500

Mf. iron, pgs., 3 450

Hdw., cs., 41 470

Ag. imp., pgs., 13 1,500

Met. bxs., case 1 80

Bremen.

Naph. gals., 130,272 9,060

Ptm., gals., 227,118 16,000

Mf. iron, pgs., 7 288

Old rails, tons, 143

Ag. imp., pgs., 192 2,057

Mach'y, pgs., 2 350

Wringers, cs., 6 160

Antwerp.

Ptm., gals., 1,166,778 93,105

Hdw., pgs., 13 640

Wire, pgs., 3 300

Sew. ma., cs., 6 1,440

Pig pr'ss's, cs., 1 281

Hull.

Clocks, pgs., 185 4,283

Hdw., pgs., 143 2,720

Mf. iron, pgs., 157 2,452

Ag. imp., pgs., 5 177

Liverpool.

Cop. m'l, aks., 970 9,000

Hdw., pgs., 48 3,692

Mch. pgs., 17 1,358

Pumps, pgs., 29 2,068

Met. gds., cs., 1 115

Clocks, cs., 78 3,011

Sew. ma., cs., 4 202

Cp. ore, bbls., 507 5,000

Wringers, cs., 9 240

Water wheel, 1 50

Ptm., gals., 340,000 30,000

Mf. iron, pgs., 13 119

Pistols, cs., 1 700

Saws, pgs., 6 78

Saw, pgs., 6 78

Portsmouth Dock.

Lead ore, bbls., 127 6,000

Newcastle.

Ptm., gals., 197,850 15,086

Glasgow.

Mf. iron, pgs., 39 1,346

Iron drums, 20 1,600

Ag. imp., pgs., 5 169

Ox. zinc, bbls., 100 960

Cartridges, cs., 4 158

Hdw., pgs., 28 325

Mach'y, pgs., 45 1,320

Boilers, pgs., 94 752

Guns, cs., 9 196

Cylinders, cs., 1 500

Nails, bxs., 165 557

London.

Ptm., gals., 355,700 26,000

Hdw., cs., 9 130

Nails, cs., 2 60

Mach'y, pgs., 2 200

Sew. ma., cs., 27 800

Clocks, bxs., 215 5,303

Mf. iron, pgs., 14 125

Falmouth.

Ptm., gals., 233,060 21,200

Barcelona.

Pig pr'ss's, cs., 4 263

Mf. iron, pgs., 81 292

Cadix.

Hdw., cs., 2 80

Genoa.

Hay press, pgs., 5 100

Hdw., cs., 3 55

Sew. ma., cs., 1 30

Hayti.

Nails, kegs., 40 160

Clocks, cs., 15 352

Ptm., gals., 750 120

Hdw., pgs., 13 79

Hong Kong.

Ptm., gals., 391,100 42,307

Japan.

Ptm., gals., 490,000 50,225

British West Indies.

Mf. iron, pgs., 15 238

Nails, kegs., 70 504

Anchors, 3 1,661

Ptm., gals., 14,347 1,661

Hdw., pgs., 11 136

Y.m.sh'h gcs., 4 308

British Possessions.

Hdw., pgs., 212 3,764

W. mills, cs., 4 91

Ptm., gals., 19,800 2,788

Cartidges, cs., 1 26

Sew. ma., cs., 1 26

Nails, pgs., 1 9

S. rollers, cs., 1 20

Ag. imp., pgs., 15 510

Pumps, pgs., 3 100

Rifles, cs., 2 105

Tin, slabs, 1275

Straus A. D. & Co.

Brass, bbl., 1

Metal, bbl., 3

Old metal, cs., 10

St. Louis Stamping Co.

Tin pils., bxs., 59

Wilson D. H. & Co.

Gun caps, cs., 2

Winter & Smilie.

Tin, ingots, 506

Order.

Tin pils., bxs., 4665

Spelter, pils., 22,093

Old metal, cs., 22

Antimony, cs., 35

Tin, slabs, 6336

Quicksilver, bottles, 100

Tin, ingots, 1808

Old metal, pgs., 15

Zinc, cs., 252

Old metal, cs., 7

Gun caps, cs., 4

Gun caps, cs., 4

Gun caps, cs., 4

Gun caps, cs., 4

Gun caps, cs., 4

Gun caps, cs., 4

Gun caps, cs., 4

Gun caps, cs., 4

Gun caps, cs., 4

Gun caps, cs., 4

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Gun caps, cs., 4

Gun caps, cs., 4

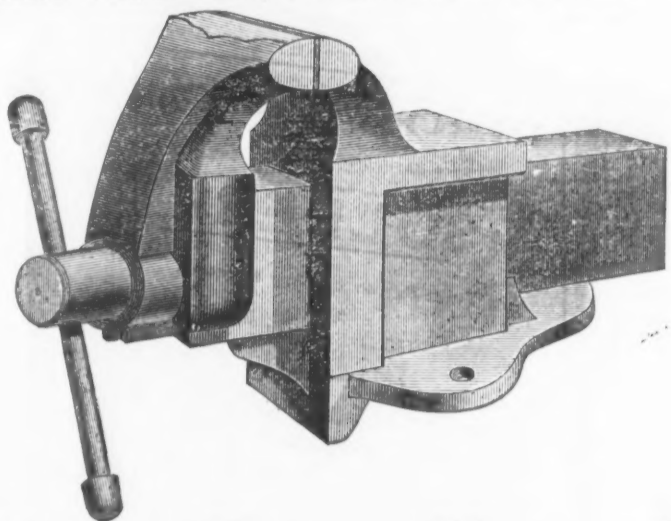
Gun caps, cs., 4

MECHANIC'S VISE.

We are familiar with all the best vises in market, having most kinds in use at our factory. We know it is useless to offer a new style if no better than the old. This Mechanic's Vise is better, having everything of value in the others, and in addition a steel-faced anvil, which the others have not. We append the weight of each Vise, with the price, by which it will be seen that they cost less than other first-class vises of equal weight.

Those who are fitting up shops will find it a good thing to look into this matter. We make a large discount to dealers, which they will probably divide with consumers who buy in lots.

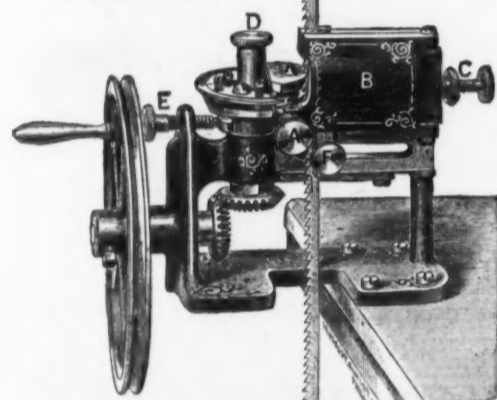
MILLERS FALLS CO., 74 Chambers St., New York.



Width of Jaw. Inches.	Opens. Inches.	Weight. Pounds.	Price Each.
2 1/4	3 1/4	18	\$4.00
3	4 1/4	22	5.50
3 1/4	4 3/4	28	7.00
4	5 1/4	35	8.50
4 1/4	5 3/4	42	10.00
5	6 1/4	50	12.50
5 1/4	6 3/4	58	15.00

AMESBURY'S BAND SAW FILING MACHINE.

Patented June 28th, 1881,
and July 12th, 1881.



Will Save Its Cost in a Few Weeks.

Any boy that can turn a crank can file a band saw in from five to ten minutes, more accurately than an expert filer can do the same by hand in one hour. Keeps the teeth even and level, and enables the saw to do more and better work with much less strain. Pronounced by users to be the best labor-saving machine ever introduced.

First Premium and Diploma of
St. Louis Agricultural and
Mechanical Association
1881, Awarded for

Best Band Saw Filing Machine.

Is sold at a price within the reach of every one using a band saw. Reduced Price List.—Net price, including 25 files, \$32; thin corner and facing files, per dozen, \$1.20; thick beveled files, per dozen, \$1.80. Terms strictly cash. Send for Catalogue and Testimonials.

G. W. Amesbury & Co.,
3101 & 3103 Chestnut St., Phila., Pa.

CHAMPLAIN

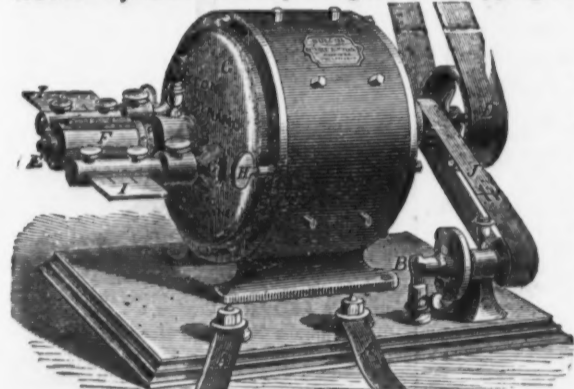
Forged Horse Nails.

MANUFACTURED BY THE
NATIONAL HORSE NAIL CO.,
Vergennes, Vermont.

HOT FORGED AND COLD HAMMERED POINTED, MADE OF BEST
NORWAY IRON AND WARRANTED.

WAREHOUSE
97 CHAMBERS AND 81 READE STREETS, NEW YORK.
DURRIE & McCARTY, Sole Agents.

HANSON & VAN WINKLE, Sole Agents for
Weston Dynamo Electroplating & Electrotyping Machines, Newark, N. J.



For Nickel, Bronze, Brass, Copper
and Silver Plating.

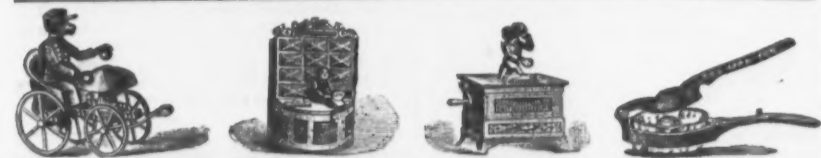
Over 1000 machines in use.
Are used by all leading stove
manufacturers.

Experienced men sent to put
up machines and instruct pur-
chasers.

INFRINGEMENTS.
We call attention to infringe-
ments of the Weston Machine
in which Automatic Switches
are used to prevent change of
current. The Weston Co. are
owners by grant or purchase
of all forms of Automatic
Switches for Plating Machines.
The adoption of these ma-
chines will certainly lead to
great loss to parties purchasing
or using them.

MANUFACTURERS OF
Cast Nickel Anodes, Pure
Nickel Salts, Polishing
Materials.

Manufactory, Newark, N. J. New York Office, 92 & 94 Liberty St.



Variety Iron Works.
KYSER & REX,

MANUFACTURERS OF
Hardware Specialties, Iron Toys, Novelties
and Housefurnishing Hardware.

Main Office and Factory, Trenton Ave. and Margaret St., Frankford, Philadelphia.
Branch Office, 11 North 4th St., Phila. Hardware specialties manufactured to order.

CHARLES H. HOWELL & CO.,

MANUFACTURERS OF

BLACK IRON VARNISHES.

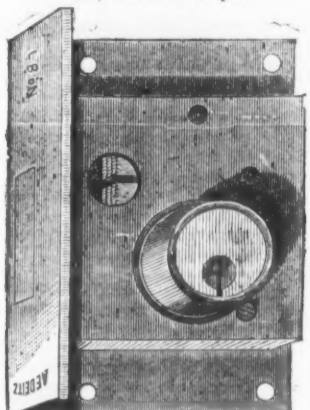
PAINT WORKS, 212, 214 & 216 Race Street.
VARNISH WORKS, Kensington, Philadelphia.

A. E. DIETZ,

(Successor to Bares & Deitz.)

Manufacturer of

Store Door Locks, Night Latches, Padlocks, Drawer Locks,
&c., with Flat Steel Keys.



Durrie & McCarty, Agents.
97 Chambers & 81 Reade Sts., New York.

THE FORSYTH SCALE CO.,
YOUNGSTOWN, O.,

Manufacture a full line of

FORSYTH'S STANDARD SCALES

Counter, Portable, Dormant,

Stock and Hay, and

R. R. Track

SCALES.

Call Special Attention to their

SUSPENSION HAY & R. R.
TRACK SCALES.

Also, Warehouse Trucks and Letter Presses.

PRINCIPAL WAREHOUSES.

FORSYTH SCALE CO., Chicago;
SIMMONS HARDWARE CO. St. Louis.

PRIZE MEDALLISTS:

Exhibitions of 1862, 1865, 1867, 1872, 1877, and only
award and medal for Noiseless Steel Shutters at
Philadelphia, 1876; Paris, 1878, and Melbourne,
1881.

CLARK, BUNNETT & CO.,
LIMITED,

Late CLARK & COMPANY,

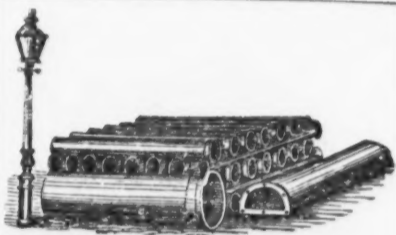
Original Inventors and Sole Patentees of
Noiseless Self-Coiling Revolving
STEEL SHUTTERS,
FIRE AND BURGLAR PROOF, ALSO IMPROVED
ROLLING WOOD SHUTTERS,

Of various kinds, And Patent

METALLIC VENETIAN BLINDS.

Endorsed by the
Leading Architects of the World.
Send for Catalogue.

Office and Manufactory,
162 & 164 West 27th St., N. Y.



R. D. WOOD & CO.,
Philadelphia,

Manufacturers of

Cast Iron Pipe

FOR WATER AND GAS,

Lamp Posts, Valves, &c.,

Mathew's Pat. Anti-Freezing Hydrants.
400 CHESTNUT STREET.

TINIUS OLSEN & CO.,
STANDARD SCALES

AND

Testing Machines.

Manufacturers of all descriptions of Testing
Machines. Tests made daily.

Office and Works, N. W. cor. 19th and
Buttonwood Sts., Philadelphia.

LOCKWOOD MFG. CO.,
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MANUFACTURERS OF

LIGHT GRAY IRON
CASTINGS.

Metal Patterns,

Iron Toys and

Hardware Specialties

Illustrated Catalogue of
Iron Toys sent on appli-
cation.



L. COES'
Genuine and Mechanics
PATENT

Screw Wrenches

MANUFACTURED BY

L. COES & CO.,
Worcester, Mass.

ESTABLISHED IN 1839.

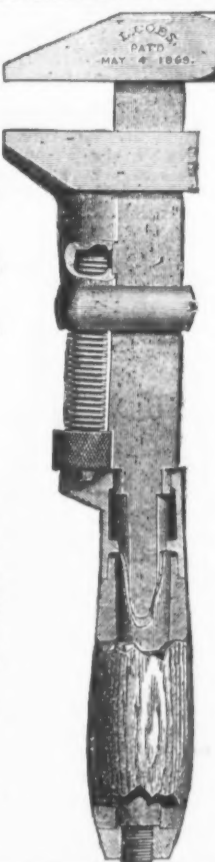
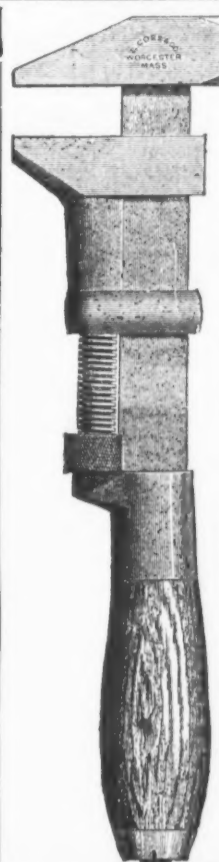


Our Genuine Wrenches are made with
straight bars, full width and enlarged jaw, hav-
ing ribs cast inside, which strengthen the jaw
and give a full bearing on front of bar. These
improvements, in combination with our new
ferrule, made with double bearings, an iron
tube, fitted to the shank and resting against
the lower bearings, rigidly held in position by
the handle and nut, effectually preventing back
thrust of ferrule (see sectional view), verify
our claim that we manufacture the heaviest
and strongest Wrench in the market. None
genuine unless stamped

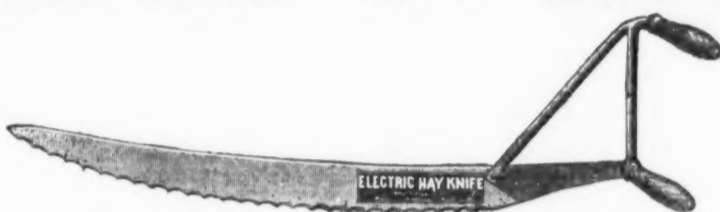
L. COES & CO.,
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Warehouse,
97 Chambers and 81 Reade Sts.,
NEW YORK.

DURRIE & McCARTY,
Sole Agents.



ELECTRIC HAY KNIFE.



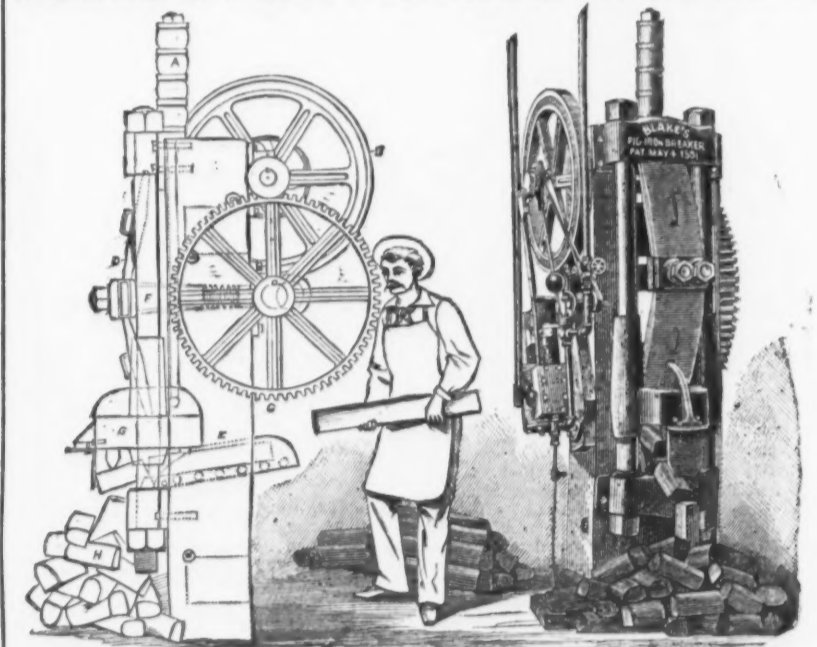
A perfect Implement for cutting Hay and Straw, or even Muck or Turf. Just the
article for cutting Silos. The handles are so arranged that the operator can stand erect
and put his strength directly upon the Knife.

The shape of the teeth gives the Knife more cutting edge than any other Hay Knife.
The Blade of the Extra Knife is solid cast steel, gold bronzed and polished. The
Blade of the No. 2 is steel, with iron back, painted green.

ELECTRIC HAY KNIFE LIST:

EXTRA CAST STEEL, per dozen, - - \$18.00
No. 2, STEEL, per dozen, - - - - \$15.00

LLOYD, SUPPLEE & WALTON,
No. 625 Market Street, Philadelphia.
BLAKE'S PAT. PIC IRON BREAKER.



A new and successful machine for breaking pig iron into any length desired, with rapidity and
economy. Besides saving in cost of breaking by hand, it secures the greatest economy in melting.
Several machines already in use. Every machine guaranteed against breakage of parts. Requires
but three horse-power. Can be run by belt or have small engine attached.
Send for Circulars, Prices, &c.

BLAKE CRUSHER COMPANY,
Sole Makers, 85 Orange Street, NEW HAVEN, CONN.

INCORPORATED MAY, 1882.

PAWTUCKET MFG. CO.,

MANUFACTURERS OF

BOLTS, COLD PUNCHED NUTS
AND WASHERS,

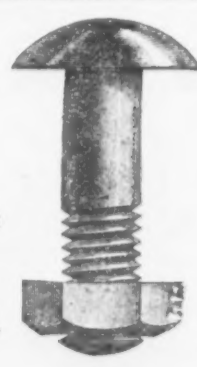
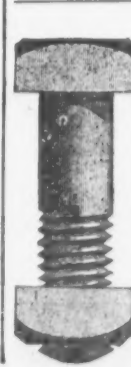
Iron and Steel Set Screws, Cap Screws, Forged or Milled

CHAIN LINKS, STIRRUPS, LEVERS, &c.

ALL KINDS OF COLD PUNCHING.

Webb's Revolving Forge Furnaces.

PAWTUCKET,
R. I.



INDUSTRIAL ITEMS.

MAINE.

"The Goss Iron Works" is the name adopted by the wooden ship builders of Bath for a large plant which they propose to establish in that city, and for which they have made liberal stock subscriptions. Up to this date \$90,000 have been secured. At a public meeting held last week to fill up the list, nearly all the local builders participated, in the belief that "the ship of the future" includes steam auxiliary, and that it is better to anticipate coming events rather than wait for them.

The Williams Slate Company have recently commenced operations in Brownsville. It is about a year since they began work on the manufactory and excavating. The width of the vein is found to be 33 feet, all good slate, but less than 3 feet which is hard rock. The lowest level yet reached is 35 feet. The slate will be all shipped to Boston.

Work has begun upon the foundation of the new machine shops in Bath, on the site of the old Rice mill property. The buildings are to be 60 feet wide and the dock filled in even with the river front of the wharf.

CONNECTICUT.

The Pratt & Whitney Company, at Hartford, are filling some special orders on high-class tools for two of the largest firms in Birmingham, England. The full force of workmen are employed, and there is a considerable increase in the number of orders at home from agricultural implement makers and for railway tools.

MASSACHUSETTS.

Amos P. Tapley, president, Frank F. Stanley, treasurer, and A. P. Tapley, F. F. Stanley and Chas. S. Randall, directors of the Stanley Manufacturing Company, capital stock, \$100,000, organized for the purpose of manufacturing and selling machinery, have filed papers of incorporation.

The manufacture of the Leader sewing machine has begun at Springfield. The company have their headquarters at Cleveland, Ohio, and their capital is \$250,000.

The Cheney-Bigelow Wire Works, Springfield, have secured additional room, in which they have placed new looms for weaving wire cloth and new wire-drawing machinery.

At Brockton, Sweetser & Merritt, machinists, are employing their full force of hands in the making of upright drills. They have recently finished eight 22-inch drills, and have orders for a number in smaller sizes. They also carry a good list of machinery used in tack and shoe-nail manufacture as well as in the line of boot and shoe machinery.

The New England Specialty Company have shipped during the last six months 40 barrels of small screw-drivers to New York, and have large orders unfilled. They are making large quantities of Leavitt's "Common Sense" can opener, but recently patented, which is said to be the best, simplest, most practical and the easiest working can opener in use at the present time.

PENNSYLVANIA.

Trade orders for "Miller's Six-Lever" improved padlock, made by D. K. Miller Lock Company, of Philadelphia, are very active this season, and the output promises to be double that of any previous year. This company now has requisitions from several leading railroad companies, both home and foreign. Since taking the prize at the Melbourne International Exhibition, the export demand has unexpectedly increased, so it is now an important factor in their business. The company claims that its "Master Keyed Padlocks" are without a rival. The well-known firm of Fairbanks & Co. are their principal factors, and show a very valuable line of the above goods.

Mr. Clark Merchant, of the firm of Merchant & Co., Philadelphia, has bought a valuable property on Cherry street, immediately to the rear and opposite their present large warehouse, which runs the entire length from Arch to Cherry street. The property purchased is 130 feet deep, and runs back to Cresson street, thus giving teams, &c., an access to each end of the premises. The location is especially valuable to Merchant & Co., and will prove a much needed relief to their rapidly extending business.

The Kensington Engine Works, Beach and Vienna streets, Philadelphia, have secured the exclusive license for the Middle and South Atlantic States to manufacture the Buckeye Automatic Engine, the sales of which have increased to such an extent that the Buckeye Company at Salem, Ohio, owners of the patents, found it necessary to establish their manufacture in the East, and selected Philadelphia as the best location. The Kensington Engine Works have been organized under the management of Mr. H. C. Francis, at present general manager of the United States Electric Lighting Company of New York. Mr. Francis was for many years connected with the well-known house of Wm. Sellers & Co. The new concern is quite busy on engines and hydrule work for the new steel works at Scranton.

Messrs. Watts, Twells & Co. (limited) of Vestal Furnace, Lancaster county, have moved their general office from Furnace to 326 Walnut street, Philadelphia. Mr. Ethelbert Watts, chairman of the above company, retires from the general management of the business, and has opened an office at 326 Walnut street, Philadelphia, as iron broker and commission merchant.

A fire occurred at the "little mill" of J. Wood & Bros., in Conshohocken, last week, by which it was entirely destroyed. The mill is situated between what is known as the "big" rolling mill of J. Wood & Bros., and the foundry and machine shops belonging to the same firm. The dimensions of the building are 200 feet long by 75 feet wide. The engine and rolls were not damaged, but the machinery, together with the other woodwork of the structure, is a total wreck. The insurance will probably cover the loss. There are various theories about as to the origin of the fire. The prevailing theory is that it was the work of an incendiary.

The 30 engines of the dirt-burning pattern ordered from the Baldwin Locomotive Works by the Philadelphia and Reading Railroad Company, have all been delivered with the exception of six, which will be furnished next month. The company is now using 600 tons of coal dirt per day as fuel, which is treated at the following collieries: Boston Run, Girard and St. Nicholas. The houses which have been built specially for the treatment of this coal have been supplied with the machinery, and will be ready for work this month.

PITTSBURGH AND VICINITY.

A charter has been granted to the Pittsburgh Furnace Company, of Pittsburgh. The incorporators are Messrs. Wm. Clark, James Hemphill, Wm. S. McIntosh, C. H. Zug and A. F. Keating, of this city, Mr. J. S. Brown, of Baltimore, and Mr. Wm. Wade, of Verona. The capital stock of the company is \$160,000. One of the company said last week that its plans had not yet been fully matured, and that a location had not been positively decided upon. At present a blast furnace will be erected, and the site will either be at Verona, on the Allegheny Valley road, or at Braddock's. It is probable, also, that the company will engage in the manufacture of iron and steel as a company. At present all of those whose names are mentioned are interested in various other iron and steel manufacturing concerns, and can easily utilize the product of a furnace, reserving to themselves the profit now paid to other manufacturers of pig iron.

The report that Everson, Macrum & Co. are about to put up a new bar mill at the Scottsdale Mill, is authoritatively denied by the firm.

It is understood that R. J. Anderson will start up a new steel mill, with Doctor Hostetter as financial backer. A company has been formed, under the firm name and title of Anderson, DuPuy & Co., Mr. DuPuy being a son-in-law of Doctor Hostetter. Mr. David Shaw, late manager of the Siemens-Anderson Works, is also interested in the new company, and will probably be the manager of the works. The company have secured property on the line of the Pittsburgh and Lake Erie Railroad, at the mouth of Chartiers Creek, and operations will be commenced at once. Within 60 days it is expected to have the works in running order. The capacity of the new concern will be 10,000 tons of finished steel annually. It will be built after the most approved style, and will contain the latest and most improved Siemens furnaces.

OHIO.

The work of clearing away the debris of the Nail City Glass Works, at Bridgeport, lately burned, has already begun, and the works will be rebuilt immediately.

The buildings of the National Machinery Company, of Cleveland, which are going up at Tiffin for the exclusive manufacture of bolt and nut machines, are being rapidly proceeded with, and, judging from the architectural designs, the carrying out of which is being supervised by mechanical engineers, will provide models of how works should be constructed for heavy machinery, with a view to the avoidance of vibration.

The Niles Fire Brick Company, at Niles, have completed their new works, near the Thomas Furnace. They are making a specialty of fire-brick and blocks for iron, steel and glass works, out of the Thomas fire-clay. They have orders booked ahead for some time. The works are under the management of J. R. Thomas, who has been engaged in the business for over 30 years.

The Miller Chain Company, Akron, manufacturers of chain, employ 50 hands. Trace and fancy chains which they are turning out merit notice; also their agricultural chains, a prime specialty. They ship all over the Union, and were never more busy than at present.

The Smith Foundry Company, New Philadelphia, has been incorporated, with a capital of \$60,000.

The Akron Iron Co.'s rolling mill has its capacity enlarged by the expenditure of \$35,000 to \$40,000. It has a working force of 325 men, and the monthly pay roll is \$20,000. The increase in the capacity is all in the direction of hot-rolled shafting, the production of which is being doubled.

The new nail works at Mingo Junction, being erected by the Junction Iron Co., of Wheeling, is approaching completion, and will be in operation by the first of next month. The works have room for 120 nail machines, but only 100 will be put in at the start.

The Youngstown Steel Co. will probably get into operation by about this time next month.

ILLINOIS.

The Hay Steel Company, of Chicago, has been incorporated with a capital stock of \$100,000, the object being to manufacture and deal in iron and steel. The incorporators are Addison L. Griffin, Oliver G. Fessenden and Frank Young.

The American Tin Plate and Steel Tool Company, South Chicago, have advertised for bids on a new building, 25 x 85 feet, and also for the construction of steel furnaces and boiler settings.

The Chicago Polished Steel Shafting Company have purchased Lamb's foundry, for some years shut down, situated on the corner of Torrence avenue and Ninety-eighth street.

The Calumet Iron and Steel Company have added a force of 105 millers to its establishment. The nail mill will now be run night and day.

That portion of the Chicago Tire and Spring Works burned recently at Melrose is being rapidly rebuilt, and the entire establishment will be in full operation within a week.

The McKenney Tubular Rail Company contemplate starting works at South Chicago for the manufacture of its patent rails.

MICHIGAN.

The following table, from the Marquette Mining Journal, exhibits, in gross tons, the total lake shipments of iron ore from

upper peninsula ports the present season, up to and including October 4, together with the amount shipped during a corresponding period last year:

Name of port.	1881.	1882.
Escanaba.....	1,141,410	1,435,278
Marquette.....	577,881	799,860
L'Anse.....	46,522	57,768
St. Ignace.....	43,296
Total.....	1,765,813	2,336,202

Showing an increase of 555,893 tons.

MISSOURI.

We clip the following from the St. Louis Age of Steel, regarding the industries of that city: The Granite Iron Rolling Mills are running day and night. The Standard Stamping Company have completed the erection of their new machinery. The Buck Stove Company are running their works to their fullest capacity day and night; the company report a regular rush of orders. Ferd Messmer's Faucet Manufacturing Company are running their works overtime, and have recently put in a new turret lathe and other machinery. The Westlake & Batton Novelty Works Company are running their works to full capacity, and report a large increase in orders for pile drivers and derricks.

The disadvantages of colored signal lights were very well illustrated by a series of experiments which were recently made by Mr. Prendergast, of the Savannah, Florida and Western Railway. They were made with red and white lights, set upon stakes 9 feet apart and 7 feet above the ground. At a distance of 1168 yards the red light was barely visible, and the red and white lights seemed very close together. A test of two bull's-eye lanterns, one red and one white, each 5 inches in diameter, was made, and at 1752 yards both lights showed, but were nearly together. At a distance of 1898 yards the red light disappeared, but the white light still showed plainly. A red 5-inch bull's-eye was against a red hand lantern, and at 1383 yards the red light and lantern disappeared. In all these tests, which, unfortunately, did not include green lights, the white lights were still plainly in sight when the red ones had ceased to be visible. If blue lights had been used, they would have disappeared at a much shorter distance than the red.

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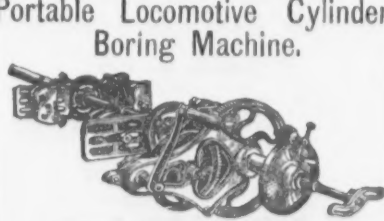
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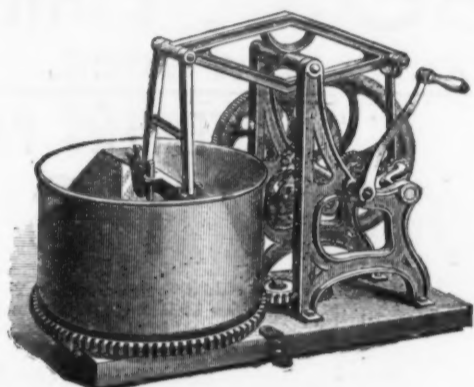
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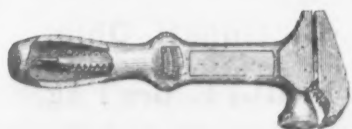
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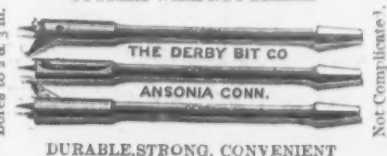
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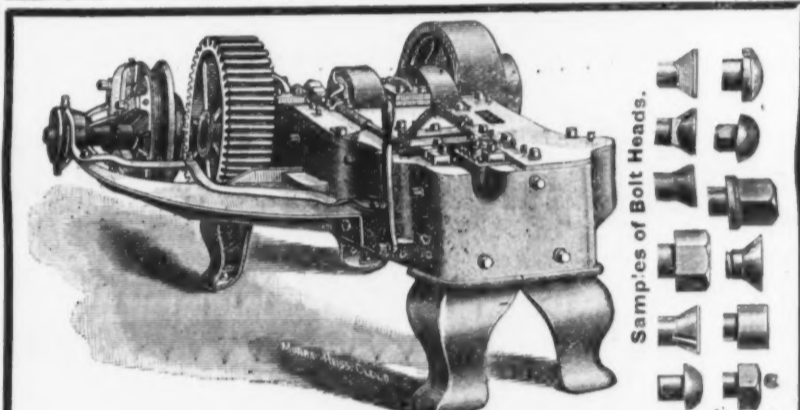
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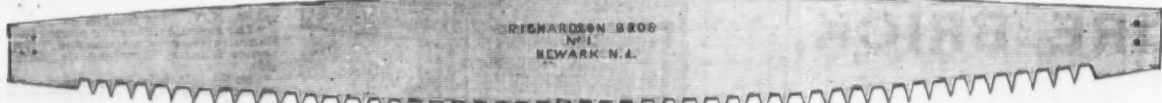
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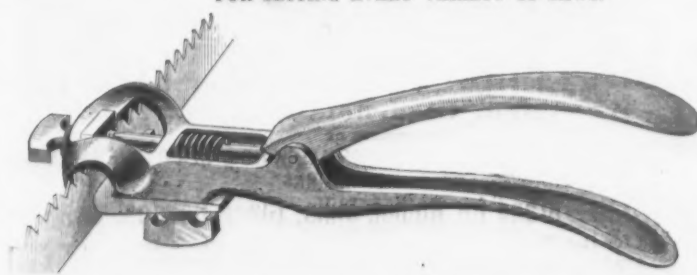
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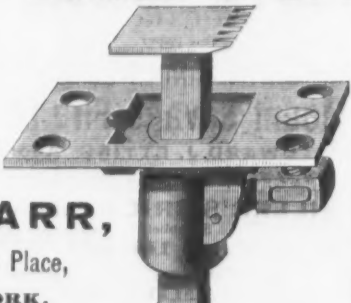
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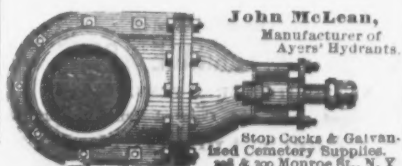


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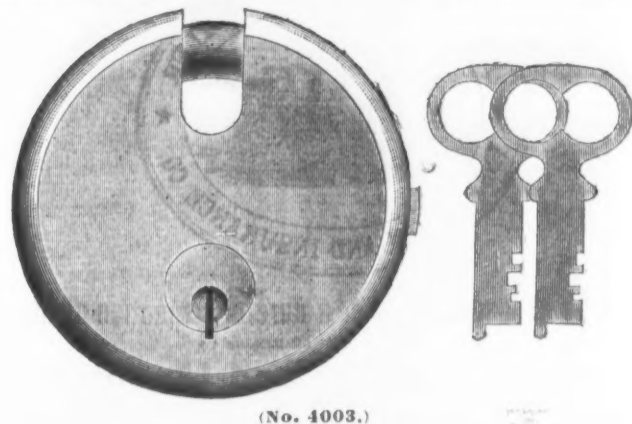
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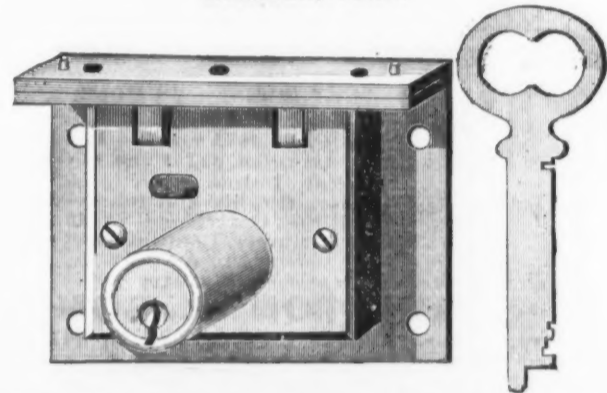
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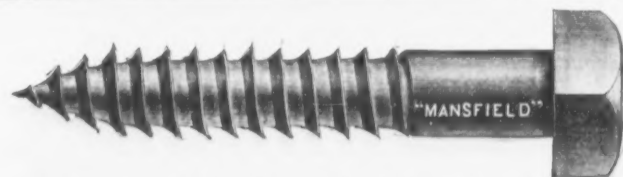
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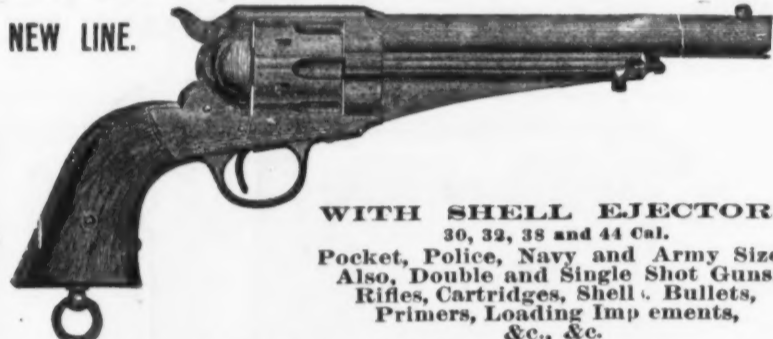
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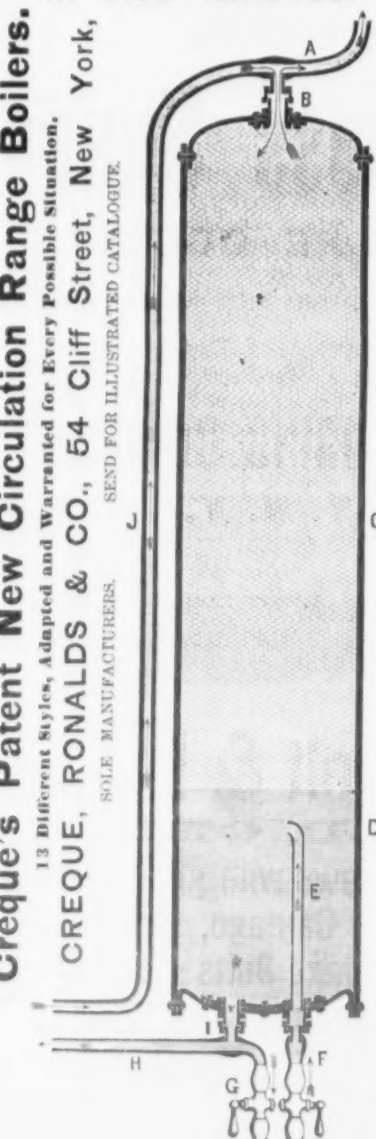


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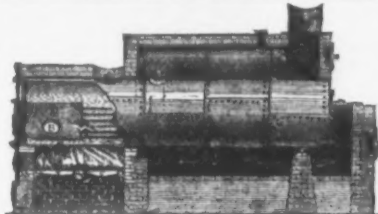


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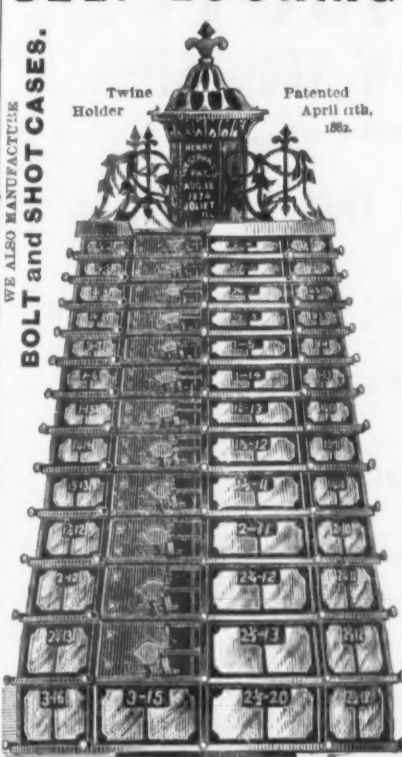
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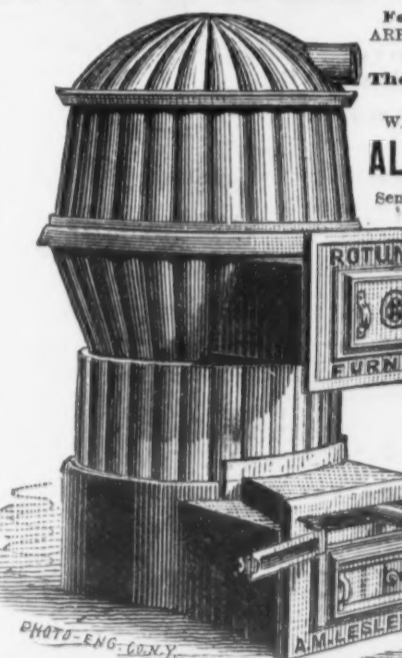
American Bolt and Screw Case Co.,
Successors to W. R. Baker & Co., DAYTON, OHIO.



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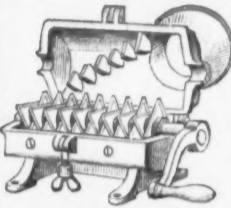
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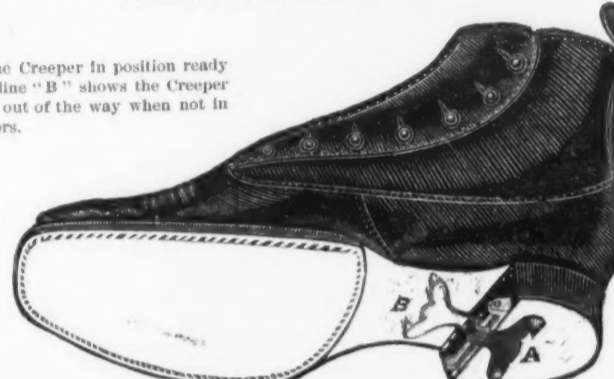
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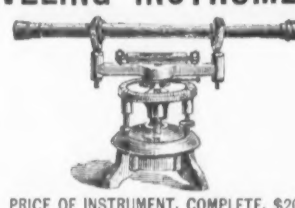
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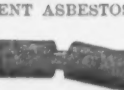
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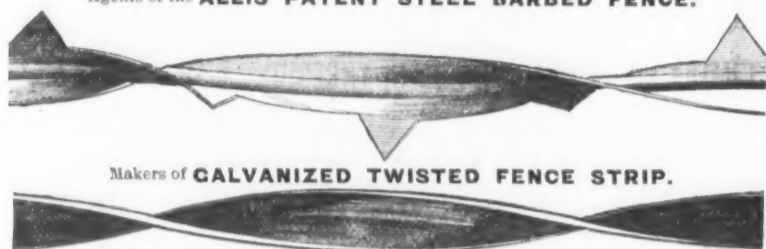
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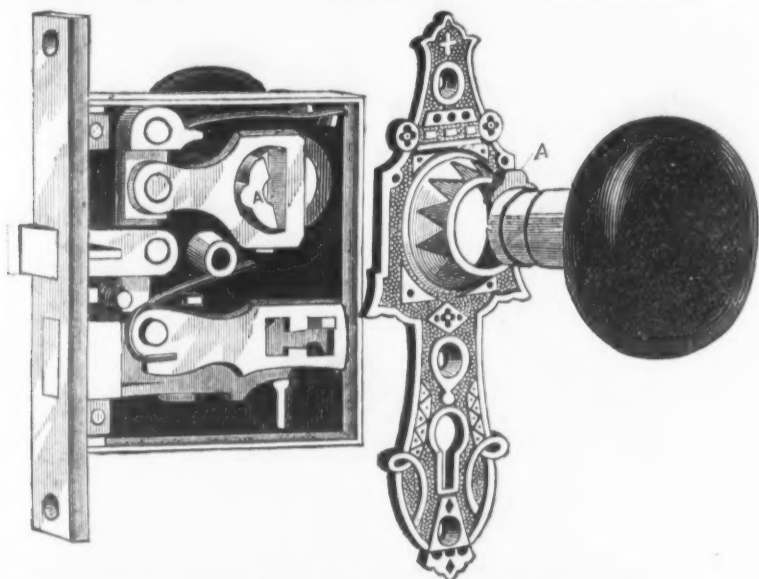
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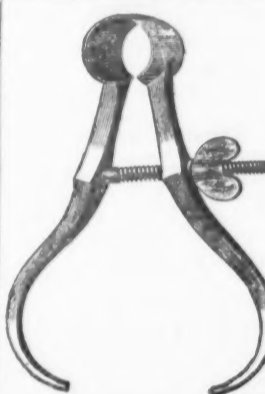
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PATENT RUBBER BUCKETS AND CHAIN FOR CHAIN PUMPS.



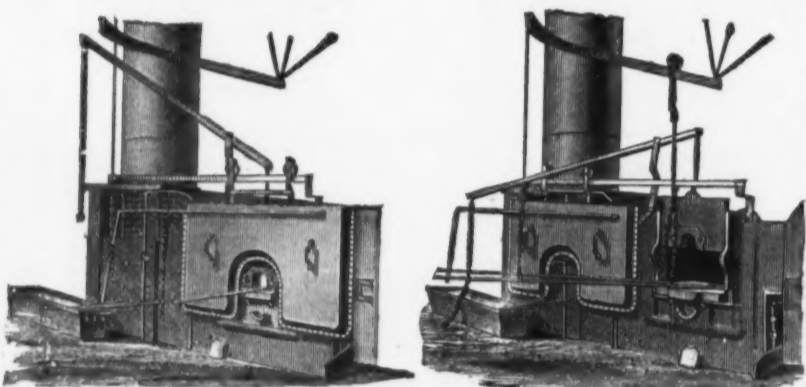
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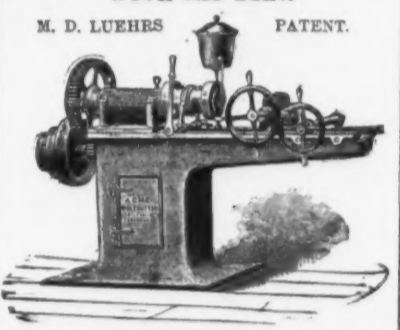


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We claim for this device the following advantage:
It works easily, without noise, but effectively.
It is very durable, extremely simple and cheap.
It can be applied to pulleys with hub one inch in
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Up to sizes capable of transmitting 500 horse-
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It can be placed on shafting in place of couplings
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It has been adopted by several of the leading man-
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friction in this is applied to the hub upon which
we hold exclusive control under patents No. 157,055,
dated Nov. 24th, 1871; Reissue No. 8,083, dated Dec.
20th, 1874. Clutches which are being placed on the
market with any device or mechanism claiming a
hub are infringing on this patent No. 8,083, and will
in due time be prosecuted to the full extent of the law.

"ACME" BOLT CUTTERS WITH CAP DIES.



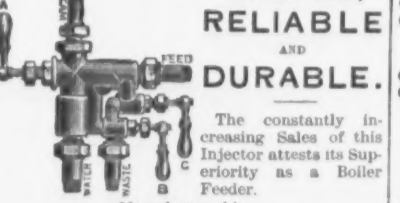
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Doubled Automatic Bolt Cutters. Single Bolt Cutters,
1/4 in. to 1 in. Rapid Bolt Cutters, Nut Tappers, 1/4 in.
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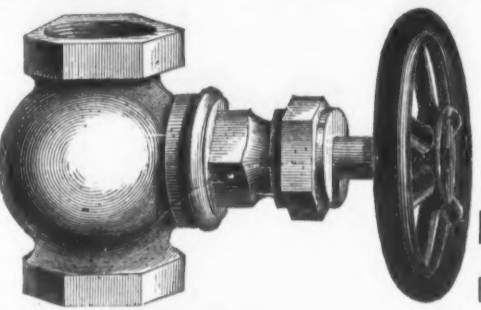


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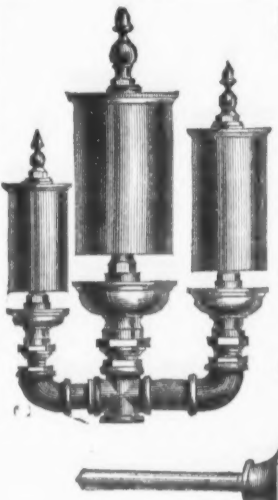


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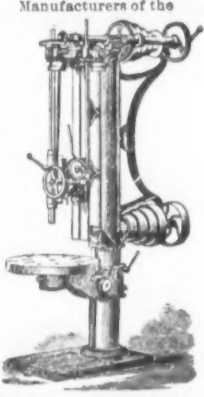


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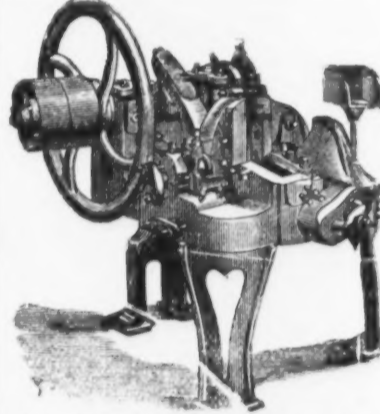


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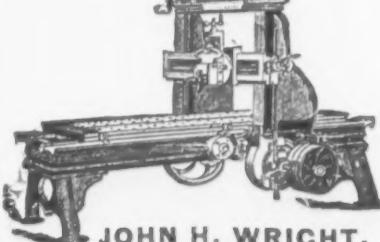
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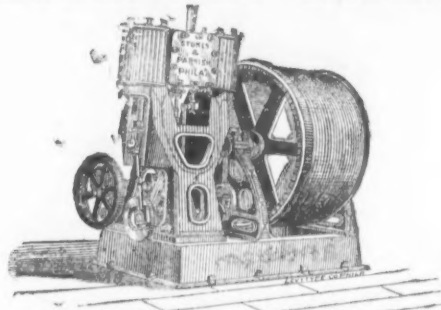
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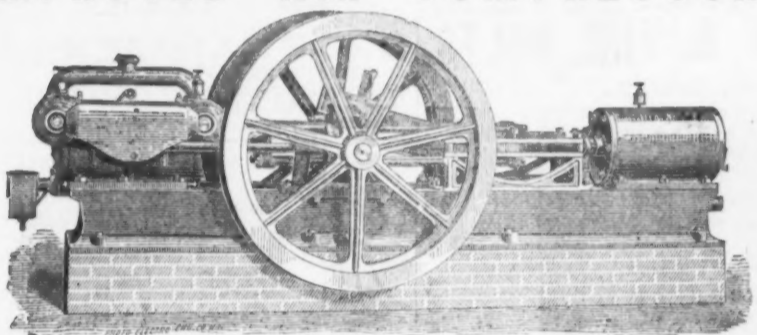
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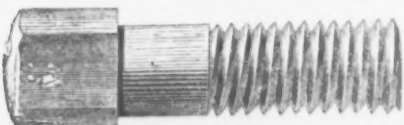
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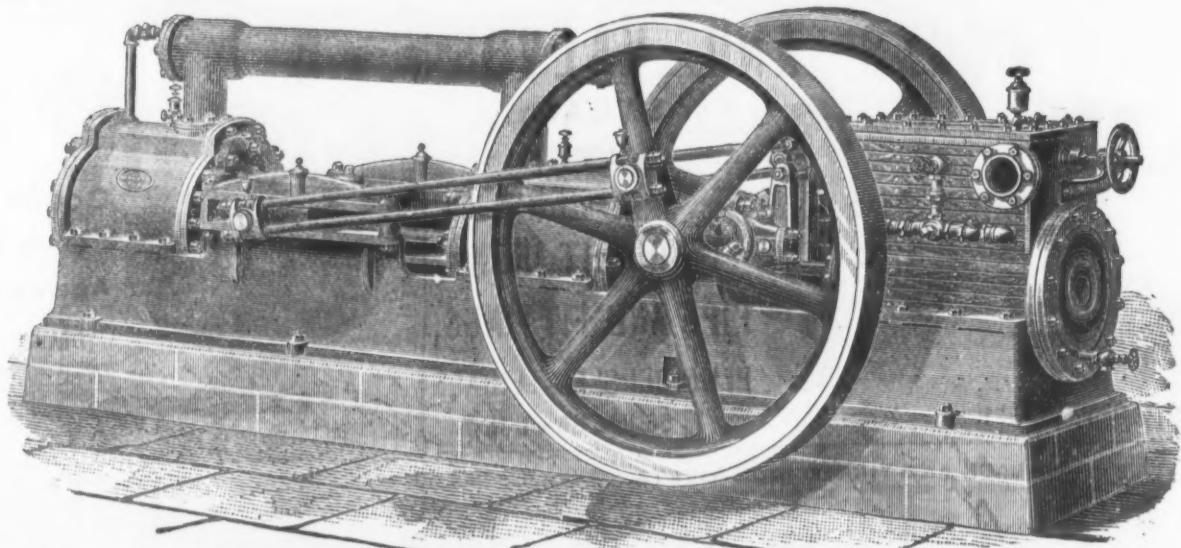
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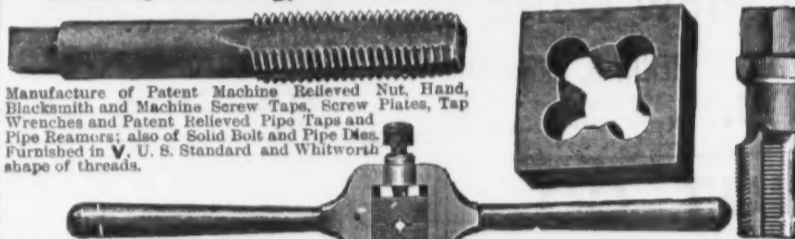
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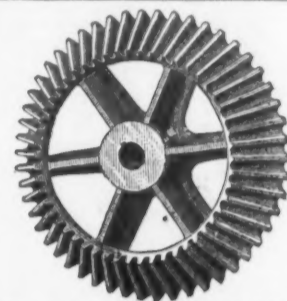
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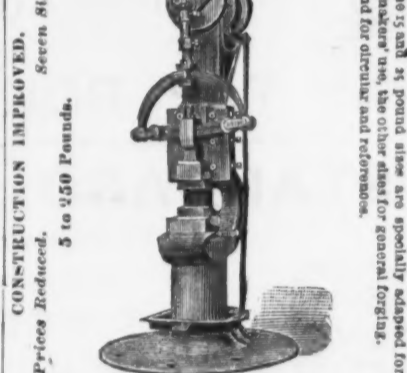
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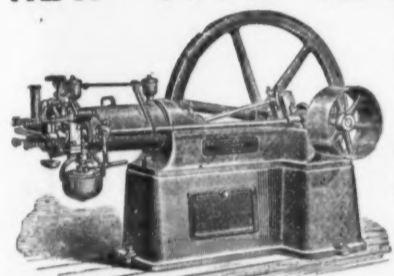
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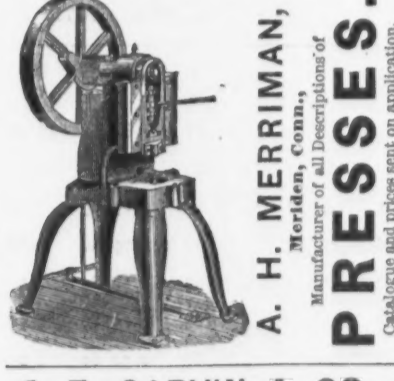


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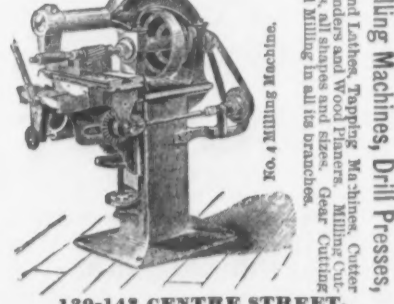
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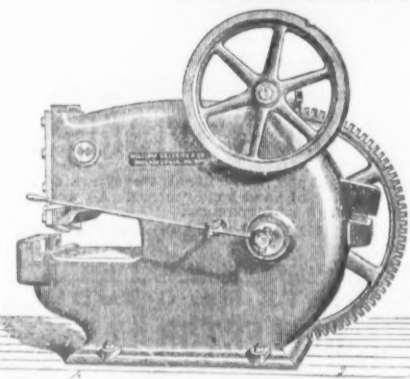
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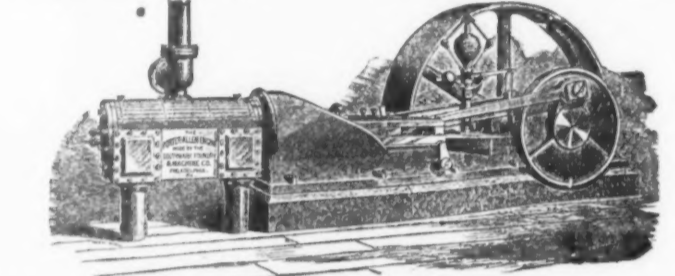
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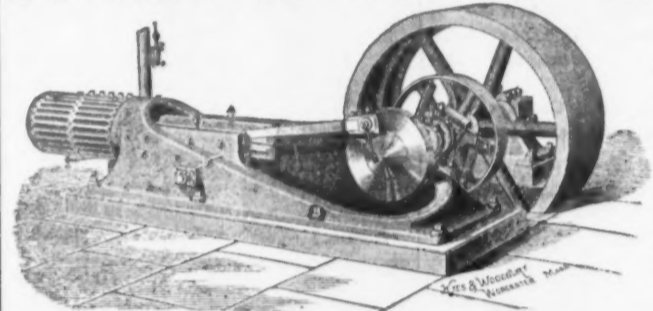
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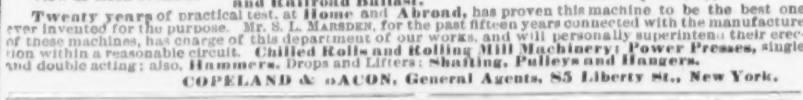
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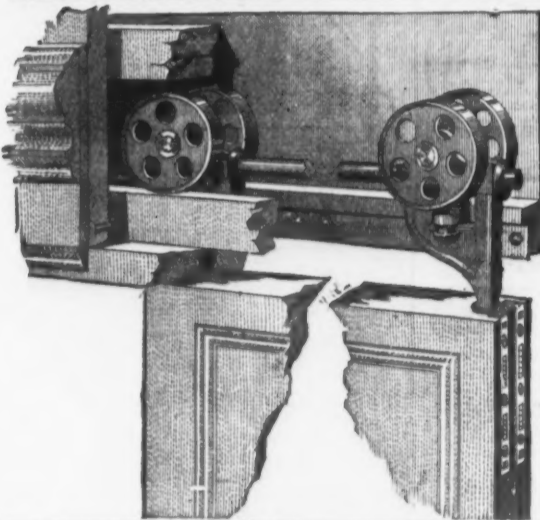
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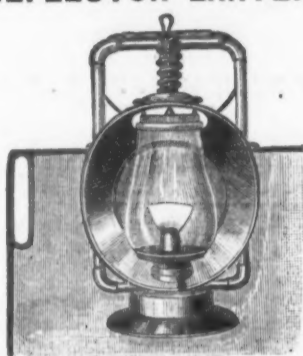
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